FOOD MANUFACTURE

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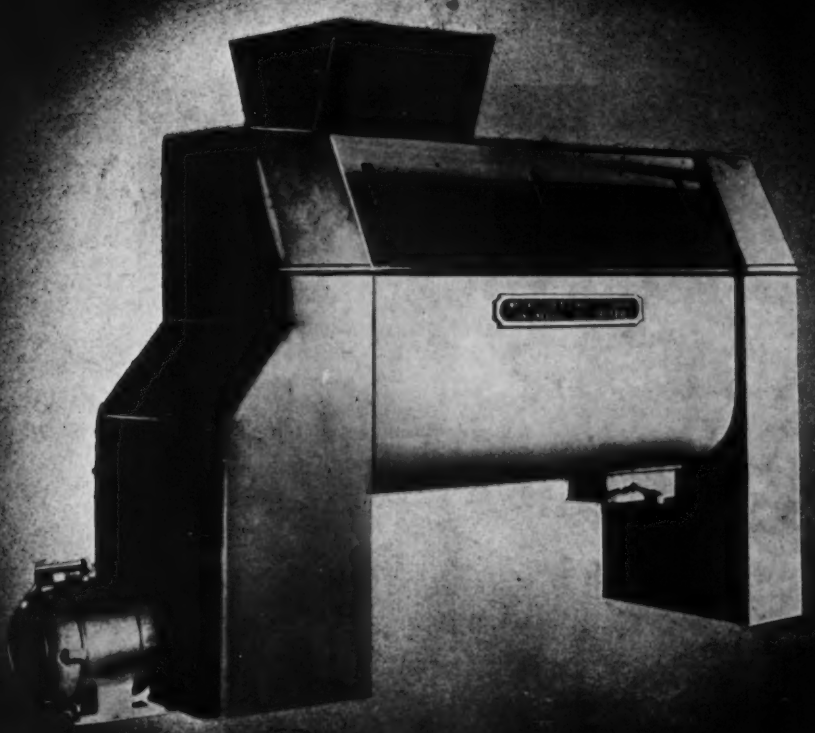

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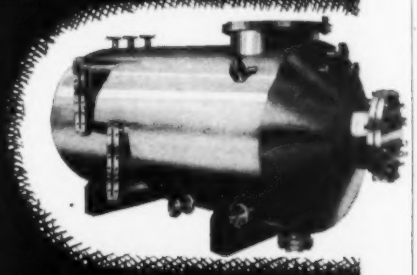

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FOOD MANUFACTURE

VOLUME XVI. No. 5. MAY 2, 1941

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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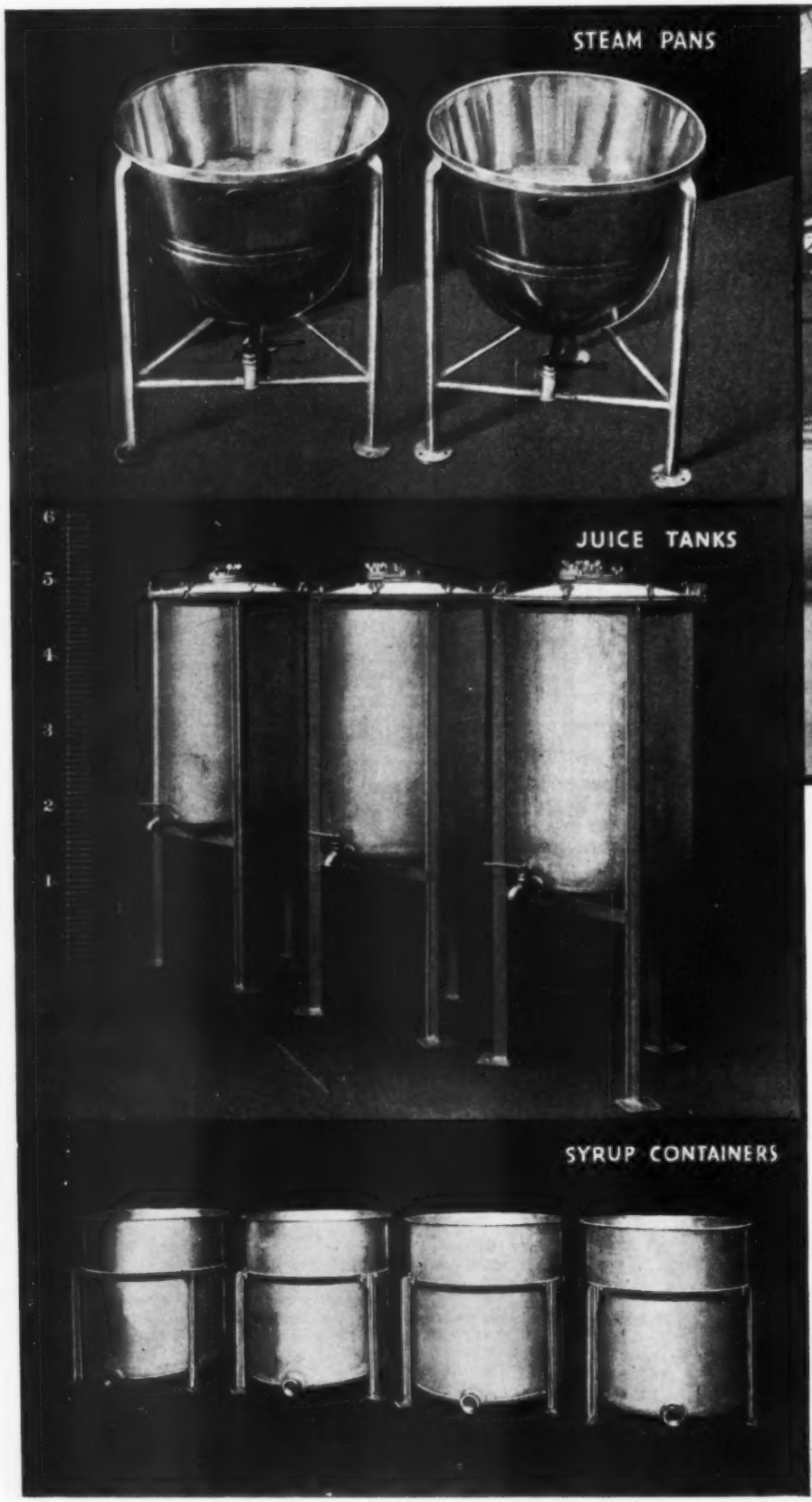

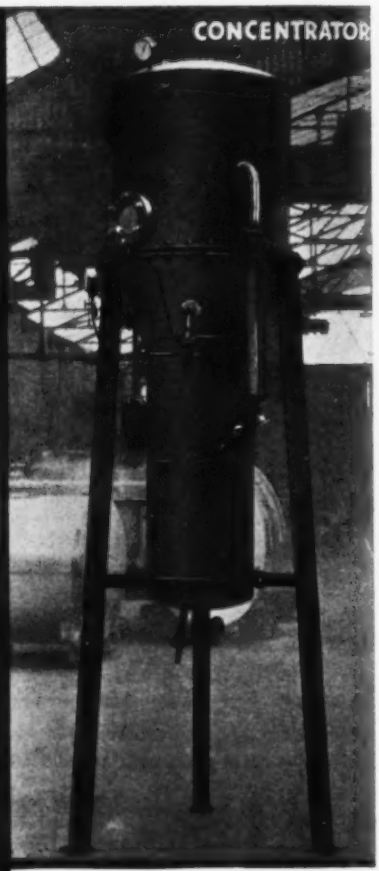

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FOOD MANUFACTURE

Vol. XVI, No. 5 May 2, 1941

Restrictions on Use of Milk

THE PURPOSE of the Use of Milk (Restriction) Order, 1941, is to secure that milk supplies are used to the maximum advantage of the consumer. The production of milk in this country has fallen since 1939, and the decline is likely to continue as a result of the shortage of animal feeding stuffs. At the same time the consumption of fresh milk has increased. Additional supplies will be required to make more cheese and condensed milk which can be stored for use next winter. In order to make the best possible use of milk in manufacture in the interests of the whole nation, a distinction has had to be made between the usages of milk which are essential and those which in present circumstances can only be regarded as luxuries. The Order prohibits the use of milk, condensed milk and milk powder in the manufacture of biscuits, bread, buns, pastries, rolls, scones and other similar articles, ice-cream, sweetmeats (including chocolate and other sugar confectionery), synthetic cream and soft or curd cheese. It came into force on April 1, but manufacturers who acquired stocks of condensed milk and milk powder before that date will be allowed to use them up. It does not apply to Northern Ireland so far as biscuits, bread and other bakers' products are concerned.

Boneless Meat

The recent statement of the Parliamentary Secretary of the Ministry of Food regarding supplies of boneless beef is of considerable interest. Arrangements have been made with the shippers in the South American meat supplying countries, who are the largest exporters of beef to the United Kingdom, to bone out 50 per cent. of all butchers' beef and 100 per cent. of all manufacturing beef and pork exported to this country. In addition, large purchases of canned beef have been made by His Majesty's Government. The boning out of 50 per cent. of the butchers' beef and of the beef for the preparation of the canned beef purchases utilises the maximum present boning out capacity of the plants. Supplies of beef from the Dominions are also boned out up to the capacity of the plants for this work. In the case of mutton and lamb, boning out is not practicable, but the carcases have been telescoped since the early days of the war to save shipping space.

Chocolate-Flavoured Chewing Gum

On the face of it a chocolate-flavoured gum should be popular among a high proportion of the Army chewers, but no such product appears to be on the market in this country. Some difficulty is met with in attempting to make a satisfactory gum from ordinary cocoa powder with its 20 to 22 per cent. fat content, as the latter tends to make the gum soft and sticky. An American maker now claims to have produced an excellent material with the aid of a cocoa powder defatted down to about 1 per cent. cocoa butter. The best way of incorporating the defatted cocoa is in the form of a previously manufactured toffee, a recipe for the latter comprising 50 parts sugar, 20 parts defatted cocoa powder, 100 parts corn syrup, 20 parts invert sugar and 10 parts skim milk powder. The mass, cooked at 245° F., is poured on to a slab and blended with an equal-sized slab of any ordinary chewing-gum with the aid of a hook or pulling machine.

Milk Vitamins

From an investigation of the forms in which vitamin B_1 is present in cow's milk carried out at the National Institute for Research in Dairying in the past year, it appears that at least four forms exist side by side: the free, unesterified and phosphorylated vitamins, and both of these in combination with protein. Each form will presumably possess its own biological significance and may well exercise a function in animal nutrition different from that of pure synthetic aneurin. Riboflavin (a component of the B_2 complex) is present in considerable amounts in milk as well as in yeast. The report of Kemmerer (*Journal of the Association of Official Agricultural Chemists*, Washington, 1940, 346-351) on the estimation of this factor in skim milk powder and yeast suggests that much of the earlier data is inaccurate, for widely variable results were obtained by fifteen collaborators. Use was made in this work of the growth method of Snell and Strong and colorimetric and photometric methods, the highest values being obtained by the colorimetric method. Variable results for the vitamin C content of milk were similarly reported by Holtz (*Hoppe-Seylers Zeitschr. f. physiolog. Chem.*, 1940, **263**, 187-205), who also produced evidence for the existence therein of the vitamin in chemically bound forms. Part of the vitamin was found to be associated in some way with the milk protein, and this accounted in part for the discrepancy between the figure for vitamin C in the whole milk and that obtained after precipitation of the protein. All the investigations here briefly mentioned strengthen the impression that the ingestion of synthetic components of vitamin complexes cannot be expected to produce effects equivalent to those of the same components in their natural associated forms.

More about Phytohormones

Since our recent mention of phytohormones we have come across several interesting papers on this subject. Alpha-naphthylacetic acid and α-naphthyl acetamide have been observed by A. E. Murneek (*Amer. Soc. Hortic. Sci. Proc.*, **36**, 432) to bring about a material reduction in the pre-harvest fruit dropping of apples. The compounds are applied by spraying with aqueous solutions containing 0·0005 to 0·001 per cent. of the active agents. At the lower concentration a drop of 24 per cent. was recorded as against 84·4 per cent. in the controls. Using the higher concentration, the loss of fruit was still further reduced. The above-named worker believes that the chemicals used have an immediate, conspicuous and valuable effect in preventing abscission of the apples during pre-harvest and harvest periods.

It is interesting to note that M. Zika (*Planta*, **30**, 151) found that after treatment of seed pieces of tubers with β-indolylacetic acid the yield of the tubers considerably increased and the starch formed had larger granules than is usual. On the other hand, methyl-naphthaleneacetate has been shown by J. D. Guthrie (*Contrib. Boyce-Thompson Inst.*, **10**, 325) to inhibit the growth of buds of potato tubers. The ester volatilises at 25° to 28° C., and the potatoes are brought into contact with the vapour. Since this vapour is toxic, the amount taken up by the potato tubers must be determined before the treatment is applied to potatoes for edible purposes.

The Factory in a Garden

Although war conditions have led to the transfer of a small number of industrial plants from thickly populated areas to the countryside, there can be no question of any wholesale dispersal of industry as fancifully suggested by some of our dreamy newspaper planners. Our great staple industries will remain in their present locations, where many factors have combined to favour their growth, until compelling reasons bring about a mass migration. This is certainly not likely to happen in our generation. But an ideal which can be aimed at is the establishment of new industrial enterprises in conditions that do not besmirch the landscape and contribute to maximum health and efficiency of the personnel, For this we require a close collaboration between architect, gardener, power-production expert and the local authorities in the districts concerned. Along these lines the conception of the factory in the garden, first realised by far-sighted and practical men in the food industry, could be realised throughout the greater part of the industrial scheme. That attractive working conditions mean dividends has also been realised in recent years by some branches of the heavier industries. The latter will no doubt have profited from the example set by the earlier food manufacturers, and we may be confident that the food processing and allied trades will continue to maintain the high standard set by the pioneers.

Export Trade with U.S.A.

In the House of Commons last month Mr. Pickthorn asked the President of the Board of Trade if he could make any statement about the effect on the United Kingdom export policy of the Lease and Lend Act. Mr. Oliver Lyttelton replied as follows: "This country needs more and more supplies of every kind from the United States. His Majesty's Government are grateful for the ungrudging aid which they have already received and are fortified by the assurance which the Lend-Lease Act provides for continued supplies of essential goods. Our need for dollars, however, remains very great, and anything which adds to our dollar earnings is a contribution of first-rate importance to our cause. That is one reason why His Majesty's Government still regard it as a necessity for this country to maintain and extend its exports to the United States, and continue to give every assistance to that trade. The extent to which this purpose can be achieved of course depends largely on the response of buyers in the United States, and I trust that they will continue to ask for our products. Experience will, I think, have demonstrated to them our ability to produce and deliver the goods and to maintain their traditional high quality."

Herb Packaging

Our grandmothers' stillrooms, with their stocks of sweet-smelling herbs, are only fragrant memories, and nowadays the choice of these delightful food adjuncts appears to be reduced to the bottle or packet of "mixed herbs", which at their best cramps the style of the best intentioned cook. We dutifully read the Ministry of Food's "Food Facts", and then come to the conclusion that whoever it is who supplies them is what is popularly termed a "good plain cook". The epithet *gourmet* may be a reproachful one just now, but there is such a thing as making the best of any job, and this leads us to the contemplation of marjoram, sage, thyme, chervil and so on. In *Modern Packaging* was described recently the marketing of seasoning herbs, herb seeds and seasoning bouquets in small glass jars which fit, in sets of six, into cabinets, and herb teas likewise fitted but packed in paraffin-lined square set-up boxes instead of glass jars. All this is much too luxurious to-day, but something of the kind with simple, inexpensive packaging would be attractive and probably worth the packer's while, or the suggestion might be filed for future reference.

Control of Chocolate and Confectionery

The regulations governing the control of chocolates and confectionery appear to be approved by the industry as a necessary step to limit prices and direct production and so conform to the Government's policy to limit luxury goods.

Satisfaction is expressed at the fact that the control will be more or less in the hands of the industry, as it will be exercised through associations of manufacturers and all manufacturers will be required to become members of their particular associations. Thus, problems will be studied by those well qualified to surmount them.

As a result of the regulations the production of lower-priced chocolates and sweets will be increased by production control. Preliminary price control has been fixed until the war-time associations are formed and can exercise the full control contemplated.

The instructions issued to the trade include matters such as co-ordination of mutual arrangements, which fall into line with the policy of amalgamation of a number of factories into one, with the resultant release of operatives for urgent war work.

Staling of Bread in U.S.A.

Covering some of the history and theories of bread staling and concluding with some social and economic considerations of the problem, the bulletin (No. 124) written by S. P. Greenquist, and released by the American Society of Bakery Engineers, should be of interest. Up to the year 1852 the popular opinion was that the evaporation of moisture was the sole cause of staling, but in that year Bausingault demonstrated that bread may turn stale long before it loses any appreciable amount of moisture. In 1873 E. N. Hernford advanced the theory that staling was due to a change in the distribution of moisture between the starch and gluten and the change in the texture of the loaf was due to a change in the starch. The author states that most modern theories are based upon this assumption, but that "the fly in the ointment is that it is only a theory and has yet to be proved". A description of the behaviour of starch grains is given, which is said to favour Hernford's theory.

With regard to the economic problem it is assumed that 5 per cent. of the bread made is returned as stale, and the author estimates that the loss amounts to 117,600,000 lbs. of flour per annum. This loss, of course, is produced by the modern conditions in which bread is in U.S.A. shipped many miles by truck and train. The author concludes by saying that "certainly here is a golden opportunity for some wide-awake scientist to make a name for himself and at the same time save the American people thousands of dollars yearly". British cereal chemists please note.

pH Values of Cream, Butter and Buttermilk

*p*H determinations of cream and butter sera have come into practice as a control measure in butter-making, and have been suggested as more reliable and accurate than titration methods. In a research recently conducted by Townley and Gould, of the Dairy Husbandry Section of the Agricultural Experiment Station of the Michigan State College, results of which have appeared in the Station's *Quarterly Bulletin*, designed to study the relationship of the above-mentioned values to the acidity of creams treated with different neutralising agents, data were also collected on the *p*H values of the corresponding buttermilks. The authors find that the *p*H of butter sera and buttermilk persists at a relatively uniform relationship to the *p*H of the corresponding cream when different neutralising agents are employed in the neutralisation of creams of approximately 0·5 per cent. acidity to an acidity range of 0·00 to 0·25 per cent. In general the *p*H of butter sera is approximately 0·15 *p*H unit above, and the *p*H of the buttermilk is approximately 0·10 unit lower than the corresponding cream; that is, the serum is slightly less acid, while the buttermilk is slightly more acid, than the cream.

White v. Brown Bread

The old controversy, white *versus* brown bread, which will apparently never die, constantly pursues its way in the columns of the daily, technical and medical press, but it is usually one angle of the question that is tackled at a time. One of the neatest bits of commentary on the subject that we have seen for a long time is made by A. L. Bacharach in an article published in *Biology*, vol. 6, No. 3, in which he skims over the thin ice of milling questions in a way that shows masterly diplomacy. Among other things, he says: "Various proposals have been put forward for bringing the dietary value of the loaf back to what it was in the days of stone milling. The most obvious one is, of course, to return to whole-meal bread. To this there are raised a whole series of objections. First of all, it is said that this is unpalatable to the British public, and that people won't buy it, even if its price were reduced to that of the white loaf; at present it costs rather more. This argument may, or may not, be true, but it would hardly justify perpetuation of the white loaf in war-time if there were no other objections to its replacement by whole-meal. If people could only get whole-meal bread they would not be able preferentially to eat white bread. Secondly, it has been stated that machinery in the large bakeries is adapted to making bread from white flour and is unsuitable for making it from whole-meal flour. The matter is one for baking experts, some of whom certainly do not share this view. Thirdly, it is pointed out—quite correctly—that whole-meal flour has been found not to keep as well as white flour. One would like to know whether this statement is still true, or whether it dates back to the times when much less was known about fat rancidity—one of the causes tending to lower quality. Anyhow, it should surely not involve too drastic changes in the organisation of the milling and baking industries to secure that, if wheat has to be stored, it should be stored for as long as possible in the form of whole grain, and for as short a time as possible in the form of flour. Finally, it is argued that the 'offals'—germ and bran—of wheat are an important, indeed almost the most important, item among the foodstuffs used for raising cattle and other livestock in this country. To divert them from the livestock into loaves for human consumption would, it is alleged, completely upset the balance of agricultural economics and seriously jeopardise the whole of our livestock industry. Apart altogether, however, from the questionable wisdom of a policy that diverts the wheat offals, which might go *via* whole-meal bread direct into the human stomach, by an admittedly extravagant series of operations into providing meat or milk, one cannot help noting that the commercial interests of the milling industry are said to be vitally concerned in maintaining the trade in offals. This, however, is again a matter for the experts, and one cannot do more here than record the facts—or the alleged facts."

Rubber Hydrochloride in Food Wrapping

The transparent form of rubber obtained by a process based upon the passage of hydrochloric acid through a benzene solution of rubber is making considerable headway in the United States, where it is used in thin sheet for the wrapping of a wide variety of food products. It is supplied in thicknesses of one-thousandth to two-thousandth inch, and is claimed to be completely odourless and moisture-proof, while being much stronger and more elastic than cellulose film. Two recent applications reported in the *Indiarubber World* of New York are in connection with the packing of meat and celery. The material is now being used for the packaging of meat loaves, and reduces the loss in weight due to evaporation by up to 10 per cent. while considerably extending the period of freshness. Rubber hydrochloride is rendering good service in the wrapping of cold-stored (35° to 40° F.) celery as well as in celery kept on open counters. In the former case it maintains the vegetable in the fresh condition for several weeks longer than is normally possible; in the latter the period of freshness is extended by several days.

Vegetables as Food

By reason of their vitamin and mineral contents, broccoli, watercress, mustard and cress, brussels sprouts and spinach were shown to be far and away the most valuable vegetables in the order named. In his paper read at the third of the series of Discussion Meetings on the Nation's Food, organised by the Nutrition Panel of the Food Group, Society of Chemical Industry, Dr. Magnus Pike, giving the latest analyses of a large number of vegetables, used an ingenious diagram indicating the number of hours during which a given weight of these would provide the requisite vitamins, based on the accepted standards of vitamin requirements.

Considerable increases of vegetable crops during the past year were reported by Dr. H. V. Taylor. The carrot crop was a record one, amounting to 380,000 tons, compared with 180,000 tons of the previous year. The production, however, despite the intensive propaganda carried on by the Ministry of Food in favour of this vegetable, was not entirely absorbed, and we are wondering what is to be done with the surplus, especially as a greater production is expected this year. Canning evidently does not provide a complete answer, as the sight of large heaps of cans in the windows of the grocers' shops seems to indicate. Apart from cattle food, there remains drying, and we should be interested to know to what extent vegetable drying is, or is going to be, carried on in this country. It is no new thing, as will be seen by an excerpt taken from a paper read by Dr. Prescott, at the National Canners Conference early this year, published in this issue.

Cooking and Canning of Vegetables

The results of recent experiments appear to emphasise two points: that very serious losses of vitamin occur during the storage of vegetables and much goes into solution in the cooking water. Figures for actual losses due to decomposition of vitamin were also given by Miss Mamie Olliver.

A good deal has been written on the effect of canning on the nutritive value of vegetables, and Mr. W. B. Adam's *résumé* of the subject was useful. In connection with the conservation of vitamins during canning, one of the worst snags is the loss during blanching. This loss, as the speaker suggested, is probably offset by the fresh state of the vegetables used for canning compared with vegetables bought in the shops. The matter of the salvaging of the extractives lost in blanching liquors was raised by Mr. A. L. Bacharach, and probably herein lies possibilities; in fact, Mr. Adam said that the matter was being studied.

There remains a potential loss of nutritives due to the rejection of the liquors in the can. We feel that more stress could be laid on this by the canners themselves. A spot of meat or vegetable extract and a little barley would make these liquors into palatable soups. No vitamins should be poured down the sink in these days.

Omelettes or Shampoos?

Having philosophically consumed the plate of porridge which now takes the place of our breakfast egg, we probably shared the shock of many people on hearing that these precious things were used at a West End hairdresser's for shampooing, as many as four at one shampoo. Mr. Tinker, in the House of Commons, recently asked the Parliamentary Secretary to the Ministry of Food whether he would have enquiries made and take steps to put a stop to this waste of food.

Major Lloyd George replied that although he did not wish to say anything that might prejudice consideration of this matter by the courts, he considered that the use of fresh eggs at the present time would be an offence against the Waste of Food Order and that both shampooed and shampooer were involved.

It is a psychological necessity for the members of the fair sex to maintain their atractiveness, even in war-time, but when it comes to using eggs for doing it, we demur.

ENGLISH FRUIT JUICES AS SOURCES OF VITAMIN C

The ascorbic acid content of English fruits and the different conditions under which losses of this vitamin may be incurred when juices are being made from them are discussed.

VERNON L. S. CHARLEY, B.Sc.

(University of Bristol Research Station, Long Ashton, Bristol.)

THE PAST six years have seen a steady development in the importance of the English pure fruit juice industry, and, although the increase in production of products such as pure, unfermented apple juice and pure fruit syrups and concentrates has not reached the enormous figures that have been given for German outputs, there has been a satisfactory response from a certain section of the public to the marketing of these types of beverages.

Health Value

Originally the drinks were considered wholly as attractive "thirst-quenchers" and the nutritional aspect was relegated to a back seat, if, indeed, it was ever considered at all. It was the mark of a "crank" to refer to "the health value" of fruit juices, and the suggestion that any serious attention should be given by the medical profession to an examination of the potential value of such products was discounted as unnecessary. It must be admitted that at the present time the knowledge of the precise food values that can be attributed to these juices is scanty and altogether unsatisfactory. Obviously, fruit juices are low in protein and fats and not too high in carbohydrates. Ash constituents, pectin and tannins are present, but their precise importance, when present in association with each other, has yet to be determined. The apple has a poor vitamin content, but the juice in a concentrated form becomes a very sweet syrup with a sugar content of over 60 per cent.

"Vitamin Consciousness"

Vitamin consciousness has unfortunately become so much a part of the mentality of many people that the inevitable question on mentioning a new product is, "What is its vitamin content?" There is no intention whatever to attempt to deprecate the crucial importance of obtaining the fullest possible supply of vitamins, but it is suggested that the humble apple should not be spurned for processing merely because vitamins do not literally crystallise out through the skin!

Fruit juices made by various firms in collaboration with the Long Ashton Research Station have on many occasions been used for the treatment of various disorders or diseases, and marked success has been the result in a large percentage of the cases. For example, black currant syrup has been used for the relief of hyperacidity and duodenal ulcer complaints, and successfully used, too, in cases where recognised medical remedies have failed. Is it the vitamin C in the syrup that is the cause of the relief? No one can say with assurance what constituent is responsible. A normal sample of the product contains approximately 25 per cent. glucose, 25 per cent. fructose, 80 mgs. ascorbic acid per 100 c.c., 0·4 per cent. ash constituents, 0·3 per cent. "tannin", and small amounts of pectin. All these individual substances or classes of substances are known to have a certain limited or extended significance in medical practice, but when a natural product containing them all is administered it is impossible to attribute the observed effects to any one constituent more than another.

Black Currant Syrups

In recent months there has apparently been a remarkable switch-over to black currant syrup on the part of hospitals and public health clinics, and presumably the fact that this product, as well as apple and other fruit juices, will be in increasing demand by the medical institutions, in view of the shortage of imported fruits and juices, will engender a desire to know more about the precise mechanism of the action of such products. Apart from the work of Neusser, of Berlin, and Noorden in Vienna, very little work has been published which will bear examination from a clinical standpoint, and it is suggested that the war offers a first-class opportunity of examining the effect of these pure juices on the health, freedom and recovery from disease, and even the mental health of the population—especially those who have been shelter habituees.

Chemical Composition of Fruit Juices

The chemical composition of fruit juices have been determined in so far as the chief constituents are concerned. Such substances as the sugars, pectins, tannins, etc., are all present to an extent which varies only within quite narrow limits for the different fruits. On the other hand, the ascorbic acid contents of the various juices show very considerable variations, and, despite what has been emphasised above, it is intended to confine attention to this one particular constituent of the juices in this present contribution.

Ascorbic Acid Content

During the years 1936-1939 the Fruit Products Section at Long Ashton examined the ascorbic acid content of various fruit juices, pressed from single named varieties of soft or stone fruits. The fruits were in all cases picked in firm, ripe condition, crushed, and the juice expressed and immediately analysed for ascorbic acid. The minimum and maximum figures for the milligrams of ascorbic acid present in 100 c.c. of juice over the four years were as follows:

	1936.	1937.	1938.	1939.
Strawberry ...	40-64	39-72	65	—
Raspberry ...	22-34	19-38	27	—
Red currant ...	36-47	—	—	—
Black currant ...	99-161	135-223	171-219	152-251
Gooseberry ...	26-27	20-36	—	—
Loganberry ...	—	26	—	—
Whortleberry ...	17	—	—	—
Apple	4-7	5-10	2-8	—
Blackberry ...	Trace	—	—	—
Cherry	Trace	—	—	—

The figures cover the analysis for a large number of true varieties of the fruits listed above, which fruits were taken from the variety trials at the Station. The pre-eminence of the black currant, the fruit of which has received similar treatment and results by Miss Olliver, is indicated by the data above. Strawberry juices are practically equal to citrus juices such as orange and lemon types. Raspberries are disappointing as a source of ascorbic acid, while red currants are somewhat richer in this constituent, but still far behind strawberries. The rest of the juices can be classed together as being only poor sources of the vitamin.

Varietal Variations

The influence of variety can be seen in the following columns of data, expressed in the same units as for the preceding table:

Fruit.	*Variety.*	1936.	1937.	1938.	1939.
Strawberry ...	Royal Sovereign	52·9	58·3	65·0	—
Raspberry ...	Lloyd George ...	22·5	19·4	27·1	—
,, ...	Preussen ...	24·7	21·8	27·1	—
Black currant ...	Baldwin	161·0	209·0	219·0	251·3
,, ...	Boskoop... ...	132·0	193·0	211·0	170·7
,, ...	Westwick Choice	147·0	223·0	208·0	227·2
,, ...	French	128·0	178·0	171·0	211·3

The variations in the ascorbic acid content cannot be attributed entirely to seasonal influences. The same bushes were used for each year's tests, and the influence of the increasing age of the bushes may complicate the issue. Analyses for other varieties of black currants have given values as low as 99 mgs. per 100 c.c., thus indicating that if the juice is being considered solely for its vitamin content the varietal factor must be taken into account. The black currant acreages are fortunately filled with a relatively small number of distinct varieties, and in cases where the vitamin C content is of paramount importance it should be possible to avoid the use of certain varieties which are not so satisfactory in this respect.

Vitamin C in Stored Juices

Whilst the figures given above are of importance, it is even more important to know what happens to the vitamin C, not half an hour after expressing the juice, but after one or even two years' storage. This point has been examined at Long Ashton in the case of the apple, strawberry and black currant.

Apple Juice

The enzyme treatment for pectin removal, followed by centrifuging and transference to Bohi high-pressure storage tanks, appears to reduce the already small vitamin content to practically negligible proportions. Apple juices stored for 12 months have never shown a value over 3 to 4 mgs. per 100 c.c., and in the great majority of cases the results were nil.

Strawberry Juice

Storage on a small scale has been effected by using either the cold sterilising filtration method or by pasteurisation in bottle or flash pasteurisation into bottle. In either case there appears to be very serious losses of ascorbic acid during prolonged storage, and the losses are associated with deleterious changes in flavour. Very slight fermentation in the fruit or the stabilised juice is likely to lead to extensive losses in the vitamin, and thus the storage of strawberry juice in its natural form is not recommended.

Black Currant Juice

In its natural condition black currant juice is extremely sharp, containing between 2·5 and 3·5 per cent. citric acid and only about 12 to 15 per cent. sugar. It is much too sharp to be consumed neat, and its specific gravity needs to be raised from 1·050 to at least 1·100 to provide a palatable beverage. Even with this added sugar the product is too acid for a number of people. It had been found that the retention of ascorbic acid in the pure bottled juice was considerably better than in the case of the strawberry, but the lack of balance in the product suggested that it would be regarded as a " medicine " rather than as a beverage!

Many experiments were carried out in 1938 and 1939, in which the pure juice was either sweetened to a gravity of 1·100 or neutralised, or both. The products were either pasteurised or sterilised by filtration, and were examined in January, 1941. Neutralisation had imparted a foreign flavour to the juice, but the sweetened juice retained to a remarkable degree the flavour of the fresh fruit. The vitamin content of the sweetened product stored for 2½ years was approximately 80 mgs. per 100 c.c., whilst that of the juice after 1½ years in bottle was 107 mgs. (The full results will be published in the Annual Report of the Research Station, which will appear shortly.) Thus it appears that black currant juice could be stored in a sweetened condition for considerable periods and still remain a relatively rich source of vitamin C.

Strawberry and Black Currant Syrups

In view of the Long Ashton association with the cold process for making and storing fruit syrups, it was natural that some attention should have been given to the factors relating to the retention of ascorbic acid in such products. The general scheme of processing has been published in the Long Ashton Annual Reports for 1936 and 1937. The fruit is milled, mixed with the pectin-decomposing enzyme, and the juice expressed after a period of 12 to 56 hours, according to the fruit. In commercial processing the juice is centrifuged, syruped with cane sugar to 55 per cent. solids, the acidity adjusted to 1·1 per cent. (as citric acid), and the syrup preserved by the addition of 350 p.p.m. of SO_2. The process involves some aeration, and the losses that are involved can probably be traced to this cause rather than to the catalytic effect of copper. The syrups are stored in slate tanks with an atmosphere of CO_2 covering the surface. The figures obtained over a period of years show that juices containing 180 to 190 mgs. ascorbic acid per 100 c.c. are converted into syrups which show 95 to 110 mgs. per 100 c.c., and that such syrups lose about 15 per cent. of the vitamin in the first year of storage and a further 7 to 10 per cent. in the second year. With a crop such as the black currant, which is usually under-produced, it is unlikely that any syrup would be carried over into the second year's storage, and consequently the loss on storage is not serious.

Effect of Methods of Preservation

Unless fruit syrups are sweetened up to 67° Brix there is danger of fermentation and some preservation treatment must be adopted. In a series of experiments by Mr. Sills at Long Ashton in 1939, which are fully reported in the 1939 Annual Report, it was shown that SO_2 acted as a definite preservative towards the vitamin, and this effect was most marked both in the strawberry and black currant syrups. On the other hand, pasteurisation and benzoic acid additions were much less satisfactory means of preservation. Again, the addition to strawberry syrup of hydrochloric acid to reduce the *p*H to 2·2, though perhaps not an advisable expedient, resulted in a retention of the vitamin after 389 days of 74·5 per cent. of the original value. Finally, syrups that were not preserved with SO_2 or benzoic acid, but had a very high natural sugar content, showed a loss of ascorbic acid which was slightly in excess of the samples with less sugar but preserved with SO_2.

The flavours of the fruit syrups are full and fresh, and this fact, in association both with the known stability of correctly made products from good sound fruit and the vitamin C data given above, indicate that fruit syrups have many advantages as a means of storing surplus fruit over a considerable period without a too serious diminution in nutritional value.

Effect of Light

Fawns (*Trans. Soc. Chem. Ind.*, Vol. 58, p. 193, 1939) has studied the photochemical decomposition of ascorbic acid in black currant syrup. The experimental material was made by the Long Ashton cold method, and the tests included bulk storage in a tank. The syrup stored for 435 days in the tank lost only 14·7 per cent. of ascorbic acid and 19·2 per cent. of its colour, whilst corresponding losses in the presence of light were 21·7 per cent. and 38·8 per cent. respectively in 152 days. Fawns makes the interesting suggestion that the dark colour of the juice may act as a protective pigment for the vitamin.

Effect of De-aeration

The oxidation of ascorbic acid in fruit juices can be effected by dissolved oxygen from air contained in the natural freshly expressed juice or from exposure of the juice to atmospheric conditions. The citrus fruit juice industry makes the fullest possible use of de-aeration as a means of preventing both the oxidation of flavouring substances and the natural ascorbic acid. Oxidation of this type—*i.e.*, by oxygen from the air or dissolved gases—is responsible for an appreciable proportion of the total loss in the ascorbic acid during the processing of black currants into syrup. In bulk storage the rate of loss of the vitamin content falls off rapidly after the initial period of a few weeks, and protracted terms of storage do not result in a commensurate loss of vitamin. Processing should be designed in such a way as to minimise contact with air, and an initial de-aeration would probably be of great value, although this has not yet been tested commercially at Long Ashton.

Concentrated Black Currant Juice

In the course of the general work on concentrated juice at Long Ashton samples of juice were depectinised and concentrated to a gravity of 1·300. Rather high loss in vitamin C was observed, as shown below :

Preserved juice (19.2.1940) contained 120·2 mgs. ascorbic acid per 100 mls.

Juice concentrated 7 : 1 (19.2.1940) contained 829 mgs. ascorbic acid per 100 gm.

Concentrate (3.3.1941) contained 307 mgs. ascorbic acid per 100 gm.

A further sample gave the following data :

Concentrate made 26.7.1940 contained 503 mgs. ascorbic acid per 100 gm.

Concentrate after 8 months' storage contained 348 mgs. ascorbic acid per 100 gm.

Considering that the vacuum evaporating process can be regarded as being a de-aerating process also, it is surprising that such losses have occurred. The acidities in the concentrates are very high—*i.e.*, between 15 and 24 per cent. citric acid—and a concentrate of 1 : 7 is quite sufficient to obviate the need for any chemical preservative.

THE JAM (MAXIMUM PRICES) ORDER, 1941

UNDER Emergency Powers (Defence)—Food (Jam); Statutory Rules and Orders No. 41, issued by the Ministry of Food, this Order consists of 15 articles, divided into four parts and four schedules. The First Schedule, dealing with quality standards of jam manufactured in the United Kingdom, is given below.

Provisions Relating to Quality Standards of Jam Manufactured in the United Kingdom

1. In this Schedule:
   (*a*) " Fruit content " means with respect to any jam the total quantity of fruit of the variety or varieties referred to in the description of the jam which is used in the manufacture thereof, being the quantity of fresh fruit so used or in the case where fruit pulp is used the quantity of fruit used in the manufacture of the pulp, no account being taken of added fruit juice or fruit pectin, such total quantity of fruit being expressed as a percentage based on the number of pounds of fruit required to be used in making 100 lbs. of finished jam.
   (*b*) " Minimum percentage of soluble solids " means with respect to any jam the minimum percentage by weight of soluble solids, ascertained by means of a refractometer when the jam is cold, no correction being made for insoluble solids.
2. " Fresh Fruit Standard Jam " means jam
   (i) of which the percentage of soluble solids is not less than 68·5 per cent.,
   (ii) of which the fruit content (*a*) complies with the provision of the Second Column of the scale set out in paragraph 5 below, and (*b*) consists of fresh fruit only, and
   (iii) which does not contain any added colouring matter or any added preservative other than sugar.
3. " Full Fruit Standard Jam " means jam
   (i) of which the percentage of soluble solids is not less than 68·5 per cent.,
   (ii) of which the fruit content complies with the provisions of the Second Column of the scale set out in paragraph 5 below.
4. " Lower Fruit Standard Jam " means jam
   (i) of which the percentage of soluble solids is not less than 68·5 per cent. and
   (ii) of which the fruit content complies with the provisions of the Third Column of the scale set out in paragraph 5 below.
5. MINIMUM FRUIT CONTENT:

First Column. *Description of Jam.*	Second Column. *Fresh Fruit Standard Jam and Full Fruit Standard Jam. Per Cent.*	Third Column. *Lower Fruit Standard Jam. Per Cent.*
Strawberry	42	
Black Currant	30	
Raspberry	38	
Green Gooseberry	35	20
Red Gooseberry	40	
Victoria Plum	40	
Green or Golden Plum	35	
Red Plum	40	
Strawberry and Gooseberry	40 (20/20)	20 (10/10)
Raspberry and Gooseberry	40 (20/20)	20 (10/10)
Gooseberry and Strawberry	40 (30/10)	20 (15/5)
Gooseberry and Raspberry	40 (30/10)	20 (15/5)
Apricot	40	20
Apple and Blackberry	40 (30/10)	
Apple and Black Currant	40 (30/10)	
Apple and Damson	40 (30/10)	
Apple and Plum	40 (30/10)	
Apple and Raspberry	40 (30/10)	
Apple and Strawberry	40 (30/10)	
Blackberry	38	20
Black Currant and Plum	40 (20/20)	20 (10/10)
Damson	38	20
Greengage	40	20
Plum and Black Currant	40 (30/10)	
Plum and Raspberry	40 (30/10)	
Raspberry and Plum	40 (20/20)	20 (10/10)
Raspberry and Red Currant	40 (20/20)	20 (10/10)
Strawberry and Plum	40 (20/20)	20 (10/10)
Blackberry Jelly	38	
Black Currant Jelly	30	
Damson Jelly	38	
Plum Jelly	40	
Apple Jelly	40	
Red Currant Jelly	40	20
Any jam containing the fruits above mentioned or any quality standard of any of the above-mentioned jams in respect of which the minimum fruit content is not above specified	40	20

NOTE.—The figures in brackets in the Second and Third Columns above in the case of two-fruit jams denote the respective content of such fruits in the order in which they are mentioned in the description.

NOTES ON THE MANUFACTURE OF JAM AND MARMALADE

F. C. E. READ.

THE manufacture of jam really begins with the planting of the fields and orchards, since not all classes of fruit are suitable for jam-making. One of the chief difficulties of a jam manufacturer arises from the variations in the class of fruit sent him for conversion into jam, as, although he specifies the type of fruit he requires, this is no guarantee that he will get it.

In the manufacture of jams there are two types to be considered—jam made from fresh fruit and that made from fruit pulps.

Jams made from Fresh Fruit

Where the fruit is to be made into jam immediately, it is handled in relatively small quantities—usually not more than 50 lbs. at a time, this weight varying with the size of the boiling. This leads to one difficulty for the jam boiler, since such small quantities of fruit are liable to considerable variation in quality. Where the fruit is firm and in good condition, perhaps an extra 4 or 5 gallons of water will be needed in each boiling to ensure that the fruit is cooked and that the sugar syrup has entered the cell structure. But where the fruit is soft and mushy the quantity of water added to the boiling must be reduced considerably, as a prolonged time of boiling will cause excessive breaking up of the fruit. This shortening of the boiling time leads to a reduction in the amount of invert sugar formed, and this in turn may render the jam liable to crystallisation. To avoid this, either citric acid or invert sugar must be added to the boiling to maintain a safe balance between the percentage of invert sugar and sucrose present.

Soft, mushy fruit is also probably over-ripe, and in consequence the pectin present in the fruit has been partially broken down, leading to a weak gel in the finished jam unless extra pectin is added to the boiling.

Usually a jam prepared from fresh fruit contains rather more whole fruit than one prepared from pulp, and this fact in itself often leads to difficulty in pouring the finished jam. It is essential that the rate of setting be neither too fast nor too slow. If it is too fast, the jam will tend to set before the whole of the boiling is poured, with the result that the jam poured from the last of the boiling will have a " crumbly " set. On the other hand, if the rate of setting is too slow, the fruit will tend to float to the top of the container, leaving a layer of clear syrup below. In such cases the *p*H of the jam must be adjusted to give a convenient rate of setting.

Preparation of Fruit Pulps

There is usually very little difficulty in the preparation of fruit pulps. Since relatively large quantities of fruit are handled (as

(*Continued on page* 116)

STARCH AND FOODSTUFFS

Part II

In Part I the author gave an outline of starch manufacture; some of the properties of starch and also its application as a "filler". In this second and concluding instalment some problems connected with the use of starch in the Baking and Confectionery industries are discussed.

J. A. RADLEY, M.Sc., A.I.C.
Author of *Starch and its Derivatives.*

THE ROLE of starch in the baking industry has been investigated by many workers with a view to elucidating the connection between the properties of the starch and the baking qualities of the flour from which it is derived. A. G. Kuhlman (*Zeit. ges. Getried.*, Mühl. u. Backer., 1936, **23**, 128) examined the viscosity of starch washed from various samples of wheat and tried to obtain some correlation between the figures obtained and the baking properties of the whole wheat. He prepared gels of different concentrations from the dried and powdered starches and found the viscosities of the gels from the different starches to vary. Those from soft winter wheats, which showed better baking qualities, gave starches which yielded gels having higher viscosities than starches from soft summer wheats of poorer baking qualities. Good samples gelatinised when treated with 0·4 to 0·5 per cent. caustic soda solution, but poor samples required an alkali concentration of 0·7 per cent. This worker plotted the pasting curves of the various starches when treated with alkali, and the samples from wheats of good baking properties were characterised by a sharp upward bend in the curve when the concentration of the alkali reached 0·2 to 0·3 per cent. This indicates that at this concentration of alkali an abrupt increase in the degree of peptisation of the starch takes place. On the other hand, starch from poor wheats did not show this effect even at higher concentrations of alkali.

Variety and Age of Flour

A. Schulerad (*Mühlenlab.*, 1926, **6**, 177) had previously suggested following the viscosity of the starch paste as a means of determining the suitability of *rye flour* for bread-making, and pointed out that the properties of the starch vary with variety and age of the flour. Buchanan and Nadain (*Ind. Eng. Chem.*, 1923, **15**, 1050) consider that the size of the starch granules in wheat flour is an important factor in determining the strength of the flour, inasmuch as the starch in the strongest wheats was found to have the smallest mean granule size. Alsberg and Rask (*Cereal Chem.*, 1924, **1**, 7) first thought that the difference in the viscosities of starch gels from various wheat samples might be varietal rather than due to the location of growing, but their work later convinced them that the answer was not so simple as this, as significant differences in viscosity were found between starch gels prepared from different samples of the same variety of wheat. In general, winter wheat starches gave higher viscosities than those prepared from summer wheats, a fact confirmed by A. G. Kuhlman (*vide supra*). Had these workers also determined the gel strength of the pastes they prepared, it seems likely that, in view of Woodruff's work, better correlation between the figures might have been obtained.

The properties of the starch present play an important part in every process connected with bread-making. Ordinarily it is regarded as forming the source of carbohydrate, which is first acted upon by the diastase present in the flour, after which the sugar so produced serves as the fermentation medium for the yeast which is added. Only a small amount of the starch takes part in this sequence. When the dough is made the starch present appears to absorb very nearly the same amount of water as the gluten. In hard wheats the starch is present embedded in a relatively large amount of gluten, and very few "free" granules can be observed. In soft wheat flours, on the other hand, the gluten masses enclose less starch and a larger proportion of the starch granules are "free". These granules are readily accessible to and can readily be saturated with moisture. Thus the amount and the freedom of the starch in a flour plays a part in determining the moisture absorption, although its influence is probably less than that of the gluten. If the absorptive powers of two starches in two samples of flour are different, it follows that the water absorption will be affected.

Effect of Grinding Processes

Starch granules injured by the grinding processes swell more in cold water than do uninjured granules, and a flour that has been severely ground therefore shows an increase in moisture absorption over a flour made from the same grain but less severely milled. The gluten also contributes to this increase, as its properties have been somewhat altered also, but when the grinding has been very severe the injury to the gluten is excessive and its moisture absorption decreases. Now, injury to the starch granules has another effect, inasmuch as diastase, which is present, can act on badly injured granules in the same way as it does on gelatinised starch. Mangels (*Cereal Chem.*, 1926, **3**, 316) considers that variation in the diastatic activity of a flour is largely dependent on the susceptibility of the starch granule to attack by the diastase, so that a flour with damaged granules will ferment quicker than one in which all the granules are intact. In practice this has led to overgrinding of flours considered to be deficient in diastase. It should be noted, however, that some workers consider that grinding wheat in too dry a state leads to the excessive formation of damaged granules, which become water-soluble, and that such flours show instability and poor keeping properties.

In the Scotch process of bread-making a portion of the starch is gelatinised by scalding a portion of the flour and is thus rendered more susceptible to diastatic attack. As diastase is colloidal, it is not likely to diffuse through other colloids, such as gluten, very quickly, and it is probable that a contributory cause as to why severe grinding apparently increases the diastatic power of a flour is that the diastase is thus brought into intimate contact with the starch by mechanical means and does not have to depend entirely on diffusion to reach the starch. A further factor is that the severe grinding also liberates the diastase that is mechanically held in the various portions of the grain, for its distribution in the wheat is by no means uniform.

Water Absorption

Some workers maintain that flours with similar water absorptions may lose very different amounts of moisture during baking, and it is possible that the state and character of the starch present exerts an important effect on the moisture loss. A point in favour of this view is the effect of adding potato flour, or starch, which gives a moister-appearing loaf. Potato starch, as is well known, behaves very differently from wheat starch on heating with water. The latter gives a mass of swollen granules, but the former yields a large amount of colloidally dispersed material and a large number of fragmentary particles from the outer sacs of the starch granules (*Starch and its Derivatives*, *vide supra*).

This short discussion makes it obvious that starch does play a definite rôle in the baking properties of flour, but it must be remembered that this rôle is subordinate to the part played by the gluten. As will be seen below, when considering the staling of bread, the same statement would appear to hold true, whilst the action of the amylases present also has an extremely important bearing on the suitability of a flour for bread-making and baking processes.

The Rôle of Starch in the Staling of Bread

Oswald suggested that the syneresis of starch gels would explain the staling of bread, whilst Katz explained the phenomenon by connecting it with the retrogradation of the starch. These two changes, together with the change in the hydration capacity of starch gels with time, all appear to be manifestations of the same phenomenon. Kuhlman and Golosowa (*Cereal Chem.*, 1936, 202) traced the content of "bound" water in bread throughout the processes of baking, cooling and staling, and it was found that at the completion of the baking process the water-binding capacity was greatest and then fell during cooling and staling.

It is interesting that staling can take place independently of moisture loss, for staling can continue even when the bread is confined in a moisture-proof container. By loss of moisture the bread becomes hard, but on staling three things can be observed: the change can be reversed to a certain extent by heating, the amount of water-extractable polysaccharide gradually decreases,

and the swelling power of the crumb in water is lost. Further, Katz has shown that the X-ray spectra of fresh and of stale bread are different, while Karacsonyi has shown that the viscosity of a suspension of the breadcrumb in water changes as staling progresses. Fuller (*J. Soc. Chem. Ind.*, 1938, **57**, 562) has worked on the changes in the water absorption of breadcrumb with progressive staling. Katz had suggested that keeping bread at 60° C. was a method that prevented staling for 12 to 24 hours, but Fuller found that a slow toughening takes place at this temperature which renders it of little practical value as a method of preventing staling.

Another method suggested by Katz was freezing the bread to −20° C. (*vide supra*), at which temperature the free water is almost entirely in the solid form and no change in the hydration capacity (or retrogradation) of the starch is able to occur. If staling is due to the starch present changing from one form to another (amylose to amylopectin)—*i.e.*, the gradual setting up of an equilibrium mixture—the effect of temperature will be readily understood. At about 0° C. the equilibrium is rapidly established and enough " free " water is present to allow diffusion of the soluble starch present, but at −20° C diffusion is stopped, as no " free " water is available, and the change towards the equilibrium mixture is very slow. At 60° C., the temperature at which stale bread can be freshened, the proportions of amylose and amylopectin which are in equilibrium are different from those at normal temperatures, and are such that the bread does not take on those characteristics by which we designate it as " stale."

Aldehydes and Amines

Certain aldehydes and amines prevent the staling of bread, but unfortunately these compounds are either toxic or noxious smelling or both, and could not be used commercially. As long as these substances are present staling does not occur, but as soon as they are removed by the passage of a current of air through the crumb the normal staling process commences and proceeds to completion. The action of these substances is not clear, and, as the writer has pointed out (*vide supra*, p. 67), " it is possible that some type of addition product is formed between it (the retarder) and the hydroxyl groups in the starch, so that aggregation through interaction between these groups to produce the less soluble form of starch is inhibited. . . . It is very difficult to visualise a colloidal chemical reaction which is limited only to aldehydes and strongly basic substances, and it is just as difficult to visualise an addition compound between these substances and starch so loosely bound that the mere passage of air is sufficient to remove the volatile components." It may be, however, that an innocuous substance may one day be discovered that will have the same effect as aldehydes in preventing the staling of bread.

Baking Faults

In recent years the so-called " soda bread ", which constitutes some 60 per cent. of the bread made in Eire, and which is made by the addition of sodium bicarbonate and soured milk to the flour to make a slack dough, followed by a long baking at a comparatively low temperature, has been prone to a fault known as " stickiness ", or streaks in the crumb. Much of this trouble is due to the fact that a proportion of Irish wheat must be used by Eireann bakers and that much of this has been sprouted and out of condition. In England, when the harvest has been wet, sprouted grain is met, and when employed in making the so-called " self-raising " flour the same trouble is also experienced.

To differentiate flours likely to give rise to this fault from those which are entirely trouble-free is an important matter to the baker, and in 1922 L. A. Rumsey (*Amer. Inst. Baking*, Bull. 8) suggested that the amount of maltose produced by the action of the enzymes present in the grain on the starch content provided a useful guide as to the likelihood of a flour showing stickiness of the crumb. Kent-Jones in 1924 (*Modern Cereal Chemistry*, 1st ed.) suggested that the maltose figure could be employed as a guide to the gas-producing capacity of a flour by the Lane and Eyron method (*Jour. Soc. Chem. Ind.*, 1923, 42, 32T). For a flour to gas satisfactorily during fermentation Kent-Jones suggested that the maltose present should not be less than 1·5 per cent. or more than 2·3 per cent. Higher figures than the latter showed that the flour had a tendency to give stickiness of the crumb in baked goods. The maltose is formed by the enzymes present in the flour, and is, therefore, a guide to the amount and activity of these enzymes. It is now known, however, that two starch-splitting enzymes are present in the flour—one, beta-amylase, converting the starch into maltose and dextrin, and the other, alpha-amylase, producing dextrin. According to the variations in the ratio of alpha-amylase to beta-amylase in various flours, so the ratio of maltose to dextrin will vary. Another important point is that the maltose-producing beta-amylase is less stable to heat than the dextrin-producing alpha-amylase, especially in the neighbourhood of 64° C., at which temperature the alpha-amylase is particularly active.

N. P. Kosmin (*Cereal Chem.*, 1933, **10**, 420) recognised the importance of these facts and suggested that stickiness of the crumb could be traced to excessive enzyme activity leading to starch breakdown, so that insufficient starch remained to hold the water present, and that, as dextrin was produced in addition to maltose, the capacity of a flour to produce the former was an important criterion of quality. Kent-Jones and A. J. Amos (*Cereal Chem.*, 1940, **17**, 265), therefore, have evolved a test to measure the production of dextrin, the amount of which is expressed as a percentage of the original flour or as the " dextrin figure ", and have arrived at some very valuable conclusions. They consider that this figure reveals the extent to which a flour is likely to produce stickiness of the crumb in the baked goods made from it, and that normal sound wheats give dextrin figures well below 10·0. Should the dextrin figure lie between 10 and 14 units, trouble may or may not develop according to the baking conditions; prolonged baking in a slack oven will lead to trouble, as the alpha-amylase has a chance to exert its maximum activity, but rapid baking in a hot oven will give satisfactory results with this type of flour. When a flour gives a dextrin figure in excess of 14 units, trouble is likely to be experienced however the product is baked. According to these workers, the test has proved its value in hundreds of cases met with in a year, and it takes about two and a half hours to carry out.

The Confectionery Trade

Starch is used for several purposes in the confectionery trade, as an actual ingredient in certain products, and as a harmless inert powder for the formation of moulds for certain goods.

Recently attempts have been made to replace the gum Senegal in the so-called clear or hard gums with starch. The correct type of starch, one of the highly oxidised starches, should be used, otherwise retrogradation of the starch takes place on storage of the finished product, which consequently goes cloudy. Providing the choice of starch is correct, satisfactory results are obtainable, although long boiling-times are generally required.

Starch as a Moulding Material

The use of starch as an inert, moulding material finds wide use in the manufacture of clear gums. After the necessary boiling and processing the syrup is run into moulds formed by stamping shapes into a compact layer of maize starch. After drying, which must be carried out very carefully, the whole mass is passed over sieves which separate the gums from the starch. The latter is dressed, new starch added to replace losses and compressed again in trays, when it is ready to receive another impression to form a fresh set of moulds. Providing the starch is kept in good condition and used in such a manner that it is kept dry, the goods are produced in a condition fit for crystallisation with nothing more than a light brushing. The moisture content of the starch is kept within required limits by using starch that has been used for short stoved work for goods requiring a longer stoving.

The use of potato starch in mayonnaise is said to allow the amount of oil used to be reduced without affecting the stability of the product. At the opposite end of the range of food products from custard powders and blanc-manges comes vinegar, which is made in one process by the fermentation of maize starch sols. The vinegar made in this way differs from genuine barley-malt vinegars in having lower phosphorus and nitrogen contents, but the total solid matter is considerably higher.

Certain proprietary articles of diet are made by the action of malt extract on starch paste to produce syrups containing sugars, dextrins and malt. In some cases the starch is largely converted to dextrin by heating with acid, adjusting the *p*H value of the solution to between 4·7 and 5·2, then adding diastase or malt extract. After a predetermined time the activity of the malt is destroyed by boiling and concentrating the product to a syrup or drum-drying to give a flaky material.

Enough has been said above to show that the recent advances in our knowledge of the physical chemistry of starch has enabled us to explain many processes that have been used for years, and that we are now in the position to use this knowledge to improve these processes or to obtain closer control over them. New processes and products have already been developed by the application of the knowledge gained even comparatively recently, and it would appear that our closer understanding of the chemistry and properties of starch will lead to an even greater variety of uses for this already widely used, valuable, natural product.

THE USE OF SUGAR IN MEAT CURING

This article discusses the direct effect of sugar on the flavour of cured meat: by masking the harshness of salt; by controlling fermentative action; by modifying the *p*H value; and a number of other functions.

DR. C. ROBERT MOULTON

THE functions performed by sugar during the various processes employed in the curing of meat have been investigated in the past in a rather fragmentary manner. There has been much opinion and little fact on which to base an opinion. Recent work, such as that conducted under the direction of Dr. W. Lee Lewis, of the Institute of American Meat Packers, and financed in part by the Corn Industries Research Foundation, combined with the experience of meat curers with shorter cures, has advanced present knowledge. Not all the questions have been answered, and much work remains to be done. However, enough has been learned to warrant a fuller discussion of the subject.

The discussion will present what is known and what is believed concerning the following: Direct effect on flavour, masking the harshness of salt, effect on flavour in other ways such as control of fermentative action, effect on types of micro-organisms, effect on the acidity (*p*H) of the meat and the pickle, effect on the texture and tenderness, effect on colour formation and stability, and effect on the cooked colour of the meat. Perhaps other functions might be added to this list, but it will serve as an outline of what follows.

Flavour Value of Sugar

It is commonly believed that the sugar used in sweet pickle curing, in dry curing, and in sausage and other comminuted meat products has a direct value in the flavour produced. It is also common practice to use sugar along with salt in the preparation of many foods. It is certain that most curers of meat ascribe a different flavour to sugar-cured meats than to those cured without sugar, just as they ascribe a flavour value to nitrate (or even nitrite) present in other than salt-cured meats.

There must be some reason for this belief. In looking for the reason, one should be guided by the scientific method of controlled experiments in which one factor at a time is changed, while all other factors which might affect the situation are held constant. This may not be possible. For example, no two pieces of meat are exactly alike. Even the right and left hams from the same hog may vary in weight, in distribution of fat and lean, and in some other ways not known. Yet such right and left hams (or shoulders, or bellies) give as good checks as are to be found. However, it is often necessary to use different lots of meat without selection of right-side pieces of the animals for one lot and left-side pieces for the other. Also, if there are more than two lots called for, such a method cannot be used, since the hog has but two hams. Nevertheless, much information can be gained by using lots of meat that are alike in other respects.

Sugar Contents of Cured Meats

The sugar content of meats cured commercially in the United States is not high. Irrespective of fairly considerable variations in the preparations of sugar used in the formulæ, the sugar content varies from about 0·4 or 0·5 per cent. to 1·5 per cent. or even a little higher. The comminuted meats, such as Frankfurters and canned spiced hams, show the higher figure, while corned beef may be as low as 0·2 per cent. Commercial hams may run, on the average, around 0·7 to 0·8 per cent., but sometimes are lower. The sugar is not distributed uniformly, since analysis of centre slices and butt surface pieces has shown an increase from a content of about 0·55 per cent. in the lean of the centre slice just below the fat to 0·90 per cent. near the flesh side of that slice and 1·10 per cent. in the butt slice. Soaking, smoking and cooking procedures have little effect on the sugar content, unless long cooking in water is used. This method of cooking lowers the sugar content of the ham, especially that near the surface.

Careful testing of commercial and experimental hams and some other cured meats has shown that those eating the cooked cured meats could not tell which one had been cured with sugar and which ones had no sugar. Bacon was an exception to this rule, and comminuted meats with 1·5 per cent. or more of sugar may also be exceptions. But it seems fairly safe to state that sugar as used in curing has very little, if any, direct effect upon flavour.

Masking Salt Flavour

More evidence may exist concerning the effect of sugar in masking the harshness of salt. In comminuted meats, where the sugar is added directly to the meat along with the salt and other curing agents, it is possible to control the percentages of sugar and salt. Here experience has shown a reduction of the harshness due to the salt when 2 to 3 per cent. sugar is added, with salt running up to 4 per cent. or even higher. In the case of the long-cured hams of the day of straight saltpetre-cured meats (no nitrite) the hams often became too salty by the time the cure (largely measured by colour development) was complete. Sugar as used did not hide the resulting harshness, since it was standard practice to soak and parboil the hams in order to reduce the saltiness.

With the shorter and milder cures now being used there is less salt in the ham, and soaking and parboiling are becoming obsolete. In this case, certainly, sugar plays no part in reducing a harshness from salt which does not exist.

Finally, there is the effect of sugar on flavour, brought about by changes due to the bacteria present in the meat and the pickle. The evidence is fragmentary and scattered. Sugar does have an effect upon the micro-organisms present in the cure and upon the type of action they carry out, in the opinion of those who have carried out research in this field. It does have some effect upon the acidity of the pickle and the meat. This acidity is caused by such organic acids as lactic acid, which are produced when micro-organisms use sugar as a source of energy. Lactic acid has a distinctive flavour. When added in quantity (a few per cent.) to such meats as experimental canned spiced ham, it imparts a characteristic and pleasant flavour. Perhaps this accounts for some of the beliefs concerning sugar as a flavouring agent in cured meats?

On the other hand, meats normally contain at slaughter up to 0·5 per cent. of glycogen or its product, dextrose. Micro-organisms and enzymes can, and usually do, change the dextrose to lactic acid. Consequently, meats usually have some lactic acid present, and their acidity is largely due to this acid. Curing affects the acidity of meat. This phase of the matter will be discussed further below. In the opinion of the writer, there is much still to be learned along this line.

The Effect of Sugar on Micro-Organisms

Considerable work carried on by bacteriologists has proved that micro-organisms differ in respect of their food habits, the temperatures that affect their growth, the acidity which controls their growth, the types of products resulting from their action, and in other ways.

Investigations on meat and meat products have proved that a variety of micro-organisms are present in meat and in curing vats. It is also known that some types of bacteria, yeasts and moulds produce undesirable changes in meats, while others are needed in the curing of meat. Some attempts have been made to isolate and identify the latter, and some patents have been issued which treat of the use of pure cultures of micro-organisms for use in curing of meat.

However, the curing vat and the cover pickle normally contain a mixture of bacteria that is not well defined. Some types of micro-organisms are needed in curing, for the following reasons: Sterile meat will not reduce nitrate to nitrite and so produce a normal cured colour, sterilised vats and pickle may easily prevent the development of a normal cure, and some of the sugar used in the pickles cannot be accounted for by analysis, and so is considered to be used up by micro-organisms. On the other hand, yeasts and moulds are not desirable, and certain types of bacteria cause souring or putrefaction of meats in cure, ropiness or "dogginess" in pickle, or other undesirable changes.

The amounts of sugar used in pickles or curing formulæ and

present in meat are certainly not enough to prevent the growth of micro-organisms. However, sugar as used may well help to decide the types of micro-organisms that are encouraged or permitted to grow and may also help fix the kind of chemical change being effected by the bacteria.

Effect on Acidity of Meat and Pickle

At this point it is necessary to discuss the effect of sugar on the acidity of cured meats. The acidity present in meats and other biological material is usually expressed in terms of *p*H.

In terms of *p*H, fresh meats are more acid than cured meats. Spoilage at first lowers the *p*H, but finally enough ammonia is produced, from the nitrogenous matter present, to neutralise the acidity.

The accompanying tables contain data obtained from various sources. Table 1 gives the *p*H of fresh meats, including some in various stages of spoilage. At slaughter fresh meat is slightly alkaline. Thereafter the acidity is seen to increase, but, if spoilage starts, the *p*H steadily increases, due to the fall in the acidity.

TABLE 1

ACIDITY OF FRESH MEATS

Kind of Meat.	*Condition.*	*pH.*	*Investigator.*
Beef	Fresh	5·1-5·96	Creuse
	Stored 1 day	5·3-6·2	Creuse
	Stored 2 days	4·1-6·15	Creuse
Muscle ..	Before chilling and storing	7·2-7·4	Greenwood and Griffin
	Stored 12-24 hours	5·3-5·8	Greenwood and Griffin
Ham ..	Uncured, after chilling	5·4-6·4	Callow
Meat	Stored at 60° F.:		
	1 day	5·8	Brotzu
	3 days	5·9	Brotzu
	4 days	6·0	Brotzu
	5 days	6·3	Brotzu
	6 days	6·6	Brotzu
	8 days	7·1	Brotzu

Curing and canning processes have an effect on the *p*H of meats. In Table 2 are presented data on various canned meats, cured and uncured. Some slightly spoiled canned spiced ham

TABLE 2

ACIDITY OF CANNED MEATS

Kind of Meat.	*pH.*	*Investigator.*
Tripe with milk	6·5-6·6	Cameron
Brains	6·5	Cameron
Potted meat	6·5	Cameron
Vienna sausage	6·3-6·4	Cameron
Roast beef	6·0-6·1	Cameron
Corned beef hash	6·0	Cameron
Canned spiced ham:		
meat	6·0-6·4	Moulton
juices in can	5·7-6·1	Moulton
Canned spiced ham partly spoiled:		
meat	5·1-6·0	Moulton
juices in can	4·7-5·7	Moulton

samples are included. These are more acid than the normal canned spiced hams. The canned cured meats have a lower *p*H than the uncured meats, and the juices around the canned spiced ham have a lower *p*H than the meat itself.

Some of the factors affecting the acidity of the curing pickle have been studied by Greenwood and Griffin, working under Dr. W. Lee Lewis, of the Institute of American Meat Packers, and aided by funds from the Corn Industries Research Foundation. In this experiment five lots of hams were put down, using the pickle formulæ regularly employed in the plant, with the exception of the sugar. To one lot no sugar was added, and to one each of the remaining lots 20 lb. per 100 gallons of crystalline sucrose (cane or beet sugar), crystalline dextrose, 70° sugar and 43° corn syrup respectively. About 150 lb. of hams were cured in each vat, using the usual 2 : 1 ratio for meat to pickle.

The development of acidity in the pickle was followed throughout the cure of 53 days. Table 3 gives the results. For the

TABLE 3

DEVELOPMENT OF ACIDITY IN COVER PICKLES

Type of Sugar.	*Days in Cure.*	*pH.*
All types	0	7·0
	5	6·2
	10	6·3
	15	6·2
	25	6·0
No sugar ..	35	6·0
Dextrose ..	35	5·85
Sucrose ..	35	5·65
No sugar ..	45	7·0
Dextrose ..	45	5·6
Sucrose ..	45	5·4
No sugar ..	53	7·4
Dextrose ..	53	5·75
Sucrose ..	53	5·65

first 25 days of the curing period the *p*H was independent of the type of sugar used, and even the absence of sugar in the cover pickle had no effect. Evidently the hams in the vats controlled the acidity. With further time in cure the cover pickle containing no sugar lost its acidity and finally showed an excess of alkalinity (*p*H 7·4). Dextrose, sucrose and the 70° corn sugar (not given in the table) showed a continued increase in acidity until near the end, when acidity fell. The differences in *p*H were slight. However, the 43° corn syrup showed a marked rise in *p*H from the fortieth day of cure on, reaching a high point of about 6·8.

These results indicate that the presence of sufficient sugar does affect the acidity of cover pickles as the cure progresses, keeping the *p*H between 5·4 and 5·8, with little difference being caused by the types of sugar. The 43° corn syrup gave about 0·5 per cent. of sugar in the pickle near the end of cure, and this was not enough to control the *p*H.

The concentration of the sucrose and dextrose in the two cover pickles employing those sugars fell from 2 per cent. at the beginning to about half that amount at the end, the value for sucrose being 0·9 per cent. and for dextrose 1·2 per cent. During the first 36 to 38 days of the cure the dextrose was utilised (disappeared from the cover pickle) more rapidly, but on about the thirty-fourth day the sucrose began to disappear rather rapidly and passed dextrose in this respect. The question now arises whether the sugar that disappeared from the cover pickle had entered the meat or whether it had been used by micro-organisms during fermentation. This question cannot be answered from the data obtained from this experiment. Later it will be answered.

Rate of Penetration of Sugars

These experiments also furnished data concerning the rate of penetration of sucrose and dextrose into pork tissue. Figures on concentration given immediately above would indicate by inference that both sugars entered the meat at about the same rate in terms of percentage. Other evidence obtained bears this out. Dr. Lewis pointed out, however, that the dextrose molecule is about half as large as the sucrose molecule, and it weighs half as much. Therefore, to give the same percentage concentration in cured meats the molecule of dextrose would need to penetrate into the flesh twice as rapidly as sucrose (two molecules of dextrose to one molecule of sucrose) to keep the percentage concentration about equal.

Part of the answer to the question of the use made of sucrose can be obtained from the change to invert sugar which occurs in pickles made with sucrose. The data obtained from this experiment showed that after about 12 days the presence of reducing sugars was noted in the sucrose vat. At the end of 36 days about 0·2 per cent. reducing sugars was present, and this value mounted steadily to about 0·7 per cent. at the end of the cure. By adding 0·7 per cent. and 0·9 per cent. (the sucrose remaining) a total of 1·6 per cent. is found. What happened to the other 0·4 per cent.? Again these data will not furnish an answer.

Bacterial counts and yeast counts were made on all five cover pickles at various stages during the cure. In all cases both classes of micro-organisms increased. In the case of no sugar

and the 43° corn syrup the bacterial counts mounted rapidly after 35 to 40 days in cure, and were very high at the end. However, near the end of the curing period the numbers of yeast colonies fell very rapidly, probably because their normal food (carbohydrate or sugar from pickle or meat) was present in too low concentration to support their growth. The other sugars used kept the counts within a normal range (about 15 millions per millilitre for the bacteria and 3 to 6 millions for the yeasts).

What Happens to the Sugar?

Sugar is an expensive ingredient, and a packer should be careful not to throw it away or allow too much of it to be fermented by micro-organisms or to remain unused in the curing vat. The amount absorbed by the meat is limited, as has been shown. Dr. Lewis favours the use of 20 lb. of sugar per 100 gallons in the pump pickle and 10 lb. in the cover pickle. Others may prefer more or less. Much less is not wise, but much more is wasteful and unnecessary. The experience of Dr. Lewis and others has shown that both dextrose and sucrose disappear during sweet pickle curing, and that the amount absorbed by the meat fails to account for the quantity lost by the cover pickle—of course, taking into account the amount furnished by the pump pickle. Dr. Lewis has estimated that the amount fermented or otherwise unaccounted for may vary from 0·2 to nearly 50 per cent., depending on the amount of fermentation which seems not controllable. When the sucrose content of the cover pickle was increased from 10 to 20 to 30 lb., the percentage disappearing increased from 15 to 20 to 30 in one set of experiments. His experience also shows that the per cent. of inversion of cane sugar in cover pickles increases with the length of the cure and may amount to as much as 60 per cent. in some cures.

Some Facts about Kinds of Sugar

Some micro-organisms are particular about the kind of sugar they use. Others can use more than one kind. Experiments carried on by Dr. Lewis and the experience of some meat curers have shown that sugars other than sucrose can be used in curing meats. Dextrose, a "second" (a light yellow) cane sugar, molasses, raisin syrup, and even honey have been used. In most cases the results were and are entirely satisfactory. With some types of cured meats, sugars other than sucrose gave superior flavour in experimental work. Full information about the functions of the different sugars in curing is not yet available.

However, the work discussed above is furnishing part of the answers. In addition, it has given some very definite information on the rôle of sugar in colour fixation in cured meats.

The Effect of Sugar on Colour in Cured Meat

Until very recent years most chemists acquainted with the chemistry of meat curing held the view that sugar was used for its effect on flavour. Some believed that it also affected the texture and toughness of meats. Cured ham certainly has a different texture from fresh ham, and after cooking there is still a difference in texture. Most cooked cured hams are more tender than cooked fresh hams. The cause of the change in texture and toughness is not clear. A few chemists whose experience had given them a deeper insight into the curing process might have held the view that sugar plays some part in the colour cycle taking place in cured meats.

Two experiences of the author about ten years ago tended to confirm this latter view. Experimental hams cured by him in a brine that was also a thick syrup developed a much more intense red colour on the surface than is usual. Cane sugar had been used, but no attempt to follow its inversion was made. About the same time experimental packs of ham and shoulder meat from hog carcasses were being cured for later use in canned spiced hams. Cane sugar was used in most of the lots of meat which were put down in metal containers. One lot was put down with dextrose in place of sucrose. At the end of the cure (about 5 days) the entire batch of meat showed a more intense red colour than had the other batches.

Colour of Cured Meats

The proper development of a uniform stable colour in cured meats depends upon a number of things. First, it depends upon the production or use of enough nitrite to give an excess over that required to unite with the red pigment of meat, known as hæmoglobin. As is well known, nitrate will not do this, and it must be reduced by bacteria present during curing to nitrite. The acidity of meats in cure is sufficient to allow sodium nitrite to make available nitric oxide, which then forms nitric oxide hæmoglobin. When meats containing this pigment are cooked, there is a further change to nitric oxide hæmochromogen, a pigment which is more stable than nitric oxide hæmoglobin. The absence of quantities of oxidising bacteria or the lack of oxidising agents from other sources is necessary also for proper colour development and maintenance. There is also some evidence that a small amount of unconverted nitrate helps to maintain colour in cured meat.

When conditions in the meat are in unstable equilibrium or when the balance between forces making for good colour and those making for lack of colour is delicate, cured meats will fade on exposure to light and the oxygen of the air. In such circumstances the presence of sufficient quantities of a reducing sugar such as dextrose may tip the balance in favour of colour maintenance.

Effect of Sugar on Colour

The work carried out under the directions of Dr. Lewis referred to previously in this article have furnished definite information concerning the function of sugar in the colour cycle of cured meats. Some of this work will now be reviewed.

Experimental lots of pork butts were cured with the customary pickles, with the exception of the sugar. In one case no sugar was used, in a second lot the sugar was sucrose, and dextrose was used in a third lot. When submitted to test of stability of colour, the butts cured without sugar faded more readily than those cured with sucrose, and these, in turn, faded more readily than the dextrose-cured meat.

Since there was some inversion of sucrose in the above experiment, new lots of butts were cured without sugar, the cured meat was hashed and divided into four lots. To one no sugar was added, to a second sucrose, and honey and dextrose were added to lots 3 and 4 respectively. Immediately the meats were tested for stability of colour. The lot without sugar faded the most readily, the sucrose-cured lot faded less rapidly, while the two lots treated with reducing sugar were most stable. Similar results were obtained when butts cured without sugar were soaked in water, 10 per cent. sucrose, and 10 per cent. dextrose, the latter again giving the most stable colour.

Dr. Lewis concluded that reducing sugars give conditions favourable to a stable colour providing other conditions are right. When a delicate equilibrium exists, a reducing sugar throws the balance in favour of good colour. In long cures where sucrose is inverted, the type of sugar may not be so important. Reducing sugar conditions the natural pigment for greater reactivity with the colour agent (nitrite) and maintains reducing conditions, thus preventing damage from oxidising bacteria or light and oxygen in the air.

It should be pointed out that nitrite will not react with methæmoglobin (oxidised hæmoglobin) to give nitric acid hæmoglobin. However, when methæmoglobin in meat is mixed with meat that contains dextrose and nitrite and that has been protected from contact with the air, the methæmoglobin is reduced and forms the proper coloured pigment at once. The rôle of fermentation in the colour cycle was shown by pork butts, in which bacterial action was held down by toluene. Here little or no colour was developed. However, when some of the same lot of meat was allowed to ferment, colour developed with sucrose and dextrose, but the latter gave the better colour.

The significance of these results and others noted early in this article to short cures should be apparent. The use of nitrite in place of or along with nitrate shortens the length of cure by as much as one-third. In the short cure the presence of reducing sugars during the early part of the cure, when little or no sucrose has been inverted, is a further aid in securing early colour fixation, which then can start at once. The time required for curing is still further reduced.

Fermentation probably still plays a part in curing, even if nitrite and dextrose are used in the curing formula. Flavour and texture of fully cured meats are generally considered to be superior to the flavour and texture of extremely short-cured meats. Proper fermentation aids in maintaining reducing conditions and very likely produces some flavour factors. Sucrose can still perform a function here.

Effect of Sugars on Cooked Colour in Cured Meats

It has been stated above that cooking changes nitric oxide hæmoglobin to nitric oxide hæmochromogen, which is the more

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NATIONAL CANNERS ASSOCIATION

THIRTY-FOURTH ANNUAL CONVENTION

Year after year at this important meeting of experts is put on record the investigatory work carried out since the previous meeting. This work covers practically every branch of the American canning industry.

THE annual convention of the National Canners Association was held at Chicago in January, and, as usual, a large number of interesting addresses were given and papers read.

The annual address was given by the President, Mr. H. F. Krimendahl, who stressed the canners' part in national defence. He pointed out that in some respects the canning industry had a much more difficult problem than other industries in planning and carrying out its part in the defence programme, on which he found that the chief interest of the canners was now concentrated.

Lieut.-Colonel Paul P. Logan, Chairman of the Food Committee, Commodities Division, Army and Navy Munitions Board, spoke on the army's programme for procurement of canned foods. His address was concerned in laying before the canners a concrete plan which provided for the timely and orderly procurement of subsistence supplies for an armed force of any size while causing the least possible dislocation of the regular commercial market. This plan was conceived under the principle that a national defence programme of the magnitude which was being entered upon is the specific business of 130 million American citizens, each with equal responsibility to contribute his share of toil, of privation and hardship. Colonel Logan then proceeded to detail the methods by which canned foods would be purchased for Service purposes.

The annual report was presented by Secretary Frank E. Gorrell, in which the work of the different laboratories of the Association was mentioned.

Work of the Washington Research Laboratory

During the past year the work of the Washington Research Laboratory included such continuing projects as field studies, laboratory studies for the Labelling Committee, and waste-disposal investigations. In addition, new lines of work were undertaken. Among these were a survey of mould in tomato products, which resulted from a Food and Drug Administration announcement of lowered mould tolerances made just in advance of the tomato pack, a large series of experimental packs made in collaboration with the American and Continental Can Companies to test the practicability of a reduction in the amount of tin on plate used for cans, and a full-time study relating to chemical tests for pre-canning spoilage.

Chemical Detection of Spoilage

The studies on chemical detection of spoilage centred principally on sardines, and was similar to work done by others on salmon and other marine products. Much attention has been given in the past to chemical determinations for substances indicative of decomposition. In the main, studies on chemical detection of spoilage in food products have yielded disappointing results. For years indol was regarded as a chemical criterion of spoilage, and much research was applied in studying its significance and perfecting laboratory procedures for its detection. However, it is now held to be a poor criterion of spoilage, and it comes seldom into consideration where spoilage detection is attempted.

From the work on sardines and on salmon it now appears that volatile acids may be taken as a measure of protein breakdown. From a practical standpoint this means that as decomposition progresses the volatile acids increase. By measuring the amount of acids by strict chemical procedure it is possible to show a correlation between the amount of acids and the condition of the product. It is planned to do further work to ascertain for what classes of products the volatile acids index is significant.

Bacteriological Field Studies

In connection with the corn and tomato juice season, survey work was done for 89 factories. The collaborative studies on tomato juice canning to which reference was made in the last report were continued in 1940, and attention given principally to the effect of "flash" sterilisation. It has been recognised for several years that spoilage in tomato juice constitutes a unique problem, and this has incited interest in special methods of processing.

At the Western Branch Laboratory extensive field studies were conducted during the spinach, asparagus, pea, cherry, apricot, pear, and tomato canning seasons. In general, the work was in the nature of factory surveys, and in a few cases was in connection with the investigation of special spoilage problems.

Processes were suggested for 129 canned foods representing 95 different products. Studies of the relationship of fill to drained weight and other variables were continued in order to secure data on the behaviour of the fruit when canned. A close relationship was found to exist between concentration of going-on syrup and difference between shrinkage by volume and shrinkage by weight, both expressed on a percentage basis. The difference in shrinkage values was greater for fruits packed in extra heavy syrup, apparently approaching zero difference for syrups of concentration similar to that of the juice of the raw fruit, and becoming negative in value for fruit packed in water. In an effort to explain certain variations in shrinkage of fruit, data on the composition of the raw fruit are being secured.

Research on Staphylococci

The work being carried on by the Department of Bacteriology of the University of Chicago has been devoted chiefly to a continued study of the conditions under which toxic substances may be produced by certain bacteria, and the properties of these substances.

This work has centred largely around a group of organisms known as *Staphylococci*, which have been found in recent years to be of special significance in outbreaks of food poisoning. Work is also in progress on the growth of various types of organisms of public health significance in a variety of foods.

In connection with raw products research it was pointed out that canners and growers have a mutual interest in the continued improvement of canning crops, in better methods of production, and in protection of crops from plant pests. In the long run the work of the plant breeder, the plant disease scientist, the entomologist, and the plant physiologist results in improved varieties of canning crops, in high yields, better quality, and lower production costs.

Standardisation of Containers

The programme for the simplification of containers for the canning industry, which has been carried on as a joint project of the National Bureau of Standards and the National Canning Association for the last two years, was completed during 1940. The list of can sizes recommended for use under this programme became effective September 1, 1940. The National Bureau of Standards has prepared its report to the canning industry. This report contains the list of can sizes recommended for packing fruits and vegetables, together with the names of the firms accepting the list.

Bulletin on Labelling

Developments under the Food, Drug and Cosmetic Act are described. With the establishment of definitions, standards of quality, and fill of containers for peaches, pears, apricots, cherries, tomatoes, and peas and of definitions for tomato products and each of 40 canned vegetables, the Association felt that the labelling requirements for canned foods under the new Act were sufficiently advanced to warrant the publication of a bulletin on which all information necessary would be assembled in convenient form.

The use on the label of terms descriptive of the product in the can is not new to the industry, and establishment of the definitions of identity under the Food, Drugs and Cosmetics Act is virtual recognition of the principle of descriptive labelling as being in the interests of consumers and at the same time practical and enforceable.

Dehydrated Foods

Dr. Samuel C. Prescott, Dean of Science, Massachusetts Institute of Technology, gave an address on the *rôle* of preserved foods in the defence programme. He sketched the history of canned foods as applied to war conditions. During the 1914-18 conflict his own particular work had to do more with the examination of the many forms of dehydrated products which were offered—potatoes, soup mixtures, tomatoes, carrots, onions and other products. The problems of dehydration were of special importance, as many products were becoming available, and this process of preservation assumed greater importance than ever before because of small plant cost and apparent ease of manufacture, the savings in weight and space after drying, the types of containers which could be used, and the comparative simplicity of preparation for consumption. These problems are not as simple as at first appears.

The quality of the raw materials, the handling, the rate and method of drying, and the degree of drying, the storage and transportation under conditions which precluded moisture absorption, possibilities of contamination, and the incursions of insects while in storage, all had to be subjected to careful study. It was rather easy to get some of the products for use in the permanent training camps at home in good condition, but not so easy to get them in the same condition to the units in France, where they were supposed to arrive. Of course, the lower cost, the lighter weight and the rectangular package had distinct advantages in crowded ships where every shipping ton was important. The weaknesses of dehydrated fruits and vegetables as foods for armies in the foreign field were that time was required to restore them to normal appearance and character by reabsorbing water and making them into appetising dishes. It may be pertinent (continued Dr. Prescott) to add that dehydration as a method of food preservation has some distinct nutritional and economic possibilities even in war. Dried, cooked potatoes and some other vegetables can often advantageously replace raw products. The same applies to certain fruits which dry well, and some meats and fish can also be dried successfully. An important advantage is that these foods may be " fortified " if necessary with vitamins and so guarantee the nutritional requirements of the soldier. The possibility of this has been demonstrated by the experience of the Byrd Antarctic Expedition, which carried sufficiently large quantities of pemmican, consisting of meats, vegetables, milk powder, hydrogenated fats and other vitamin-bearing ingredients to assure the vitamin requirements of the men during their absence of two years. The mixture of ingredients in concentrated form is an ample source of the energy, tissue-building and mineral salt requirements, even when eaten with the accompanying type of cracker or hard-tack, even if no other foods were available. These foods, together with canned foods and cereals which can be made available, make it possible that the nutritional needs of the Army and Navy units can be satisfactorily met.

Canning Problems and Raw Products Conferences

A number of papers were read on canning problems. D. J. Wessel and H. A. Benjamin, of the Research Department, American Can Company, discussed Process Control of Heat Resistance Spoilage Organisms in Tomato Juice. For several years plant sanitation measures designed to keep the number of organisms entering the product to a harmless minimum have been made to control flat sour spoilage and other spoilage due to heat-resistant bacteria in tomato juice and products containing tomato juice, without complete success, and the authors discussed means of more positive control through heat treatments adequate to destroy such organisms.

With respect to processing in the can, increasing the severity of still cooks for tomato juice, using longer times and higher temperatures than are at present employed, appear impracticable because of their deleterious effect on the quality of the product. A limited study of agitating processes indicates that high-speed rotation, by increasing rate of heat penetration, holds considerable promise of permitting use of more lethal processes without serious quality impairment.

" Flash " Processing

Although only studied on an experimental basis, the results obtained indicate that " flash " processing tomato juice in a tubular heat exchanger for a time and temperature equivalent to the thermal death time of the contaminating organism, rapidly cooling to 190° F. before filling and processing of the closed cans for a brief time at 212° F. to destroy non-resistant types entering during filling, could be employed commercially with success. No loss in quality over that packed by conventional methods was found in juice canned by this procedure. Of course, the success of this " flash " sterilisation in preventing all types of spoilage would be dependent upon the avoidance of resistant contamination in the filling equipment, cans and covers. However, since the resistant spoilage organisms are of soil origin, it seems highly unlikely that with ordinary sanitary precautions recontamination would occur during the filling and closing operations.

The Use of Sugar in Meat Curing

(*Continued from page* 109)

stable pigment of the two. Sufficient heat also has an effect on the sugar present. Sucrose is changed to caramel when heated sufficiently, thus causing a browning on the surface of baked meats treated with it. When sugar-cured meats are broiled or fried, the sugar gives more or less browning of the meat.

In the case of bacon, the type of sugar used in curing notably affects the colour of the cooked bacon. Miss VeNona Swartz has reported some experimental work on bacon cured in connection with the sugar studies made under the supervision of Dr. Lewis, partly financed by funds from the Corn Industries Research Foundation. Some of the results of this work will now be reviewed.

Three lots of bacon were cured. In one lot the sugar was sucrose, in a second lot 10 per cent. of the sugar was dextrose, and in the third lot the sugar used was pure dextrose. The sliced cured bacon was fried in deep fat at a temperature of 270° to 300° F. The brown colour increased with the increase in reducing sugar.

Other lots of bacon were cured with no sugar, 100 per cent. cane sugar, and cane sugar with 5, 10, 20, 30, 40, and 50 per cent. of dextrose. Sliced bacon from each lot was cooked in fat at 270° F. until the colour was a light or medium brown. Since colour was the factor used to fix the cooking-time, it was found that the time to cook the bacon decreased from 7 minutes when no sugar was used to 2·83 minutes with 50 per cent. dextrose. The cooking losses likewise progressively decreased from 68·2 per cent. in the bacon cured without sugar to 54·1 per cent. in the bacon cured with half dextrose and half sucrose.

In two other cooking experiments different temperatures of fat were used to give the same browning in 2·5 minutes. A temperature of 355° F. was required for the bacon cured without sugar. As the per cent. of reducing sugar increased the cooking temperature fell from 325° F. for pure sucrose to 285° F. for 50 per cent. dextrose. The cooking loss for the bacon without sugar was 73 per cent. For the other lots the losses fell from 68 per cent. to 55 per cent. for half sucrose–half dextrose.

Evidently more edible cooked bacon is obtained when dextrose replaces part of the sucrose in the curing of bacon. If the different types of bacon are cooked in exactly the same manner and for the same length of time, some of the lots of dextrose-cured bacon would become too brown for the tastes of many consumers. However, if the cook takes colour as the deciding factor for " doneness ", dextrose permits savings in amount of edible food produced.

As a result of her experience, Miss Swartz suggests the replacing of between 5 and 10 per cent. of the sugar used in sugar-cured bacon by dextrose. The results obtained with bacon cured with a 9 to 1 ratio of sucrose to dextrose were : Reducing sugars present in cured bacon, 0·22 per cent. ; cooking for 3·58 minutes at 275° gave a cooking loss of 57·7 per cent. when sufficiently browned ; when cooked at 315° F., but 2·5 minutes were required for the brown colour to develop, and the cooking loss was 64·2 per cent.

Summary

Evidently sugar has a number of functions to perform in the process of curing meat. Dextrose (or other reducing sugar) is essential in normal curing. Time can be saved by including dextrose in the curing formula, and proper conditions for developing and maintaining a cured colour can be fostered. When dextrose is used in curing hams, shoulders, butts, and similar types of pork, the colour developed in cooking is normal. In the case of bacon, it appears that dextrose should be limited to around 10 per cent. of the total sugar used. However, more dextrose can be used, providing the cook is trained to stop the cooking process when the desired browning has been obtained. More edible bacon can be obtained in this case.

BOILER FUEL ECONOMY

The necessity for rigorous economy in the use of fuel to conserve national resources is an important duty in war-time. Attention is drawn in this article to some common sources of fuel losses which can be remedied at negligible or moderate expense with very substantial benefit to the fuel bill.

F. J. MATTHEWS, B.Sc.
Author of *Works Boiler Plant.*

AN important duty in war-time is rigorous economy in the use of fuel to conserve national resources and eliminate waste of productive effort. Shortage of coal supplies may also arise at any time as a result of aerial damage to producing centres, transport facilities, etc., or due to other war-time factors. Substantial fuel losses are commonly experienced in the operation of factory boiler plants, and a considerable aggregate national saving could be realised by suitable attention to the thousands of such plants throughout the country. In this brief article it is proposed to draw attention to some common sources of fuel loss which can be remedied at negligible or moderate expense with very substantial benefit to the fuel bill.

Combustion a Chemical Process

Factors affecting the supply of air to the fuel have a vital influence on the economy and efficiency of steam-raising, since combustion and heat generation is essentially a chemical process requiring proper air supply for its completion. Some excess of air over that theoretically required by a fuel must be supplied to overcome deficiencies in mixture of air and combustible gases, but it is a common fault to supply too great an excess. The extent of heat loss with various amounts of excess air is shown in Fig. 1; the amount of excess air present can be easily checked by analysing the flue gases for carbon dioxide, a good average working figure being 12 per cent. CO_2, or 50 per cent. excess air as shown in the graph. The air supply to the fuel bed is measured by the draught available on the plant, and full economy and efficiency is gained only when arrangements are made whereby firemen can regulate the draught in accordance with air requirements from time to time. Damper adjustment from the firing floor can easily be managed by rigging up a couple of pulleys, over which a cable attached to the damper passes to the firing floor; a balance weight is attached to the cable to stabilise the damper at any point desired, as shown by a pointer indicator calibrated to show the extent of damper opening at various positions. Though easy to arrange, draught adjustment is commonly neglected, due to lack of such arrangements, necessitating firemen going around actual dampers—a duty which is troublesome and therefore apt to be neglected. The need for draught regulation from time to time is shown by Fig. 2, which illustrates the varying air requirements as volatile matter is given off by freshly fired coal. It will be seen that if the air supply is kept steady at any point there will be either loss of fuel in unburnt gases (due to insufficient air) or loss of heat in the air (due to excess air being present). This difficulty is combated by frequent firing of only small amounts of fuel at a time (whether mechanically or by the fireman), so that there is very little difference at any moment in the amount of volatiles' emission, and therefore in the air requirements at the beginning and end of the firing period. With hand firing particularly, however, the draught will need to be increased just after firing, since there is a limit to frequency with which the fireman can fire the coal into the furnace.

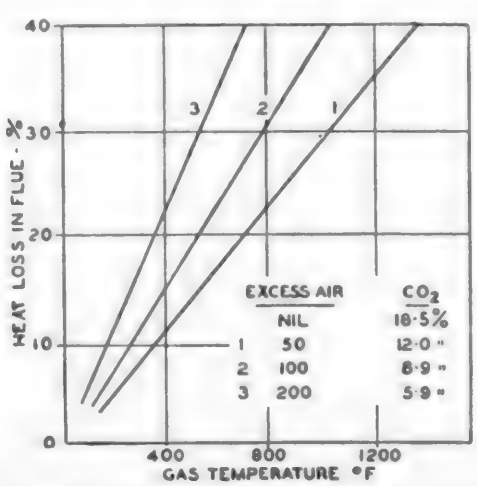


Fig. 1.—Extent of heat loss with varying amounts of excess air.

Air Admission by Leakage

Uncontrolled air admission by leakage through flue brickwork, etc., should be vigorously combated, since this is a simple way of effecting large fuel savings on many plants. Cracks in brickwork can be remedied by suitable pointing, or coating the patch concerned with cement paint. Warped and broken casings, doors and dampers should receive prompt workshop attention; badly fitting damper slides are a common source of air admission, and these should be packed with asbestos rope or the like. Much leakage is due to continual formation of expansion gaps between metal and brickwork, as a result of repeated heating and cooling of plant; if a patented system of expansion jointing cannot be installed for this, persistent attention to expansion gaps will be required to combat air leakage. Much air leakage takes place at economiser chain holes, and it is well worth while fitting patented seals at these points; the very modest expense will be rapidly recovered in most cases.

Heavy excess air admission sometimes takes place through the back of an unduly long firegrate, which cannot be kept properly covered with fire owing to its length. Substantial fuel economies have been obtained on a large number of plants by shortening firegrates from 6 or 7 ft. to 5 ft. or even 4 ft. length;

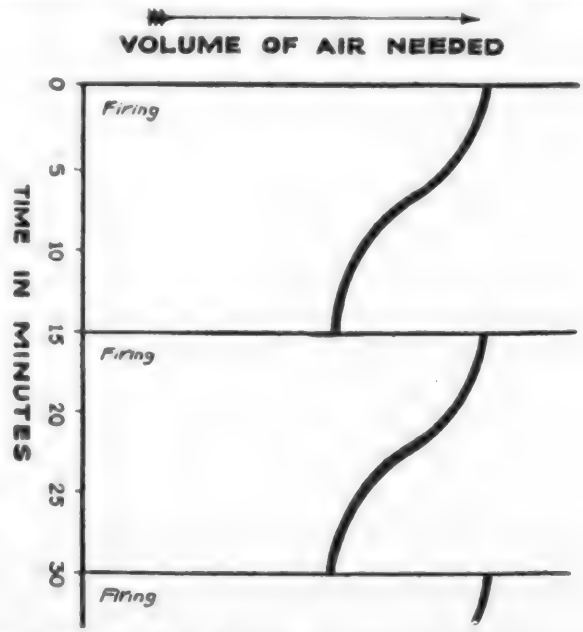


Fig. 2.—The need for draught regulation from time to time is shown here.

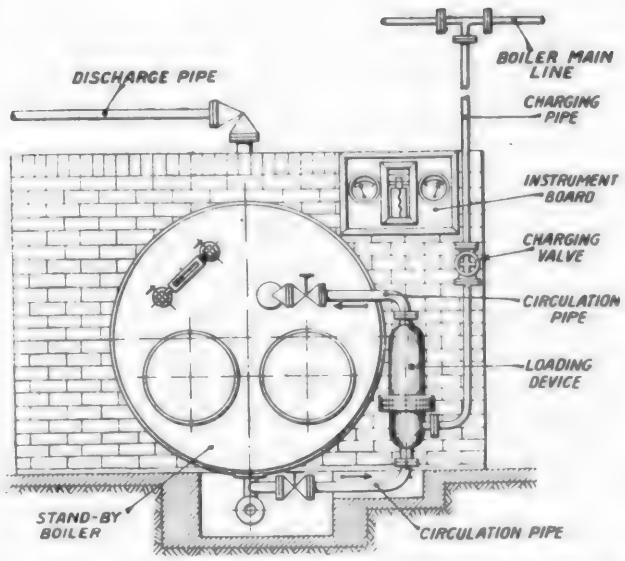


Fig. 3.—By a new system of thermal storage it is possible to convert one of a battery of boilers into a steam accumulator.

temporary makeshift shortening can be made by covering the back of the grate for the required distance with firebricks, building to a height corresponding to that of the firebridge. To cite only one example, three Lancashire boilers had their 7-ft. grates shortened to 5 ft., and the result was a fuel saving of 20 per cent., while only two boilers then sufficed to meet steam demands.

Reduction of Firebridge Height

Another simple alteration which has saved fuel in many plants is the reduction of the firebridge height. The firebridge is an obstacle imposing resistance to gas flow, and this resistance reduces the draught power and thus the air supply to the fire. Serious combustion difficulties have been cured simply by taking off the top course of bricks from a high bridge; a further improvement is to provide bull-nosed bricks for the top course, to lessen resistance to gas flow. The proper heights for firebridges on Lancashire and Cornish type boilers are: boilers 7 ft. and less in diameter—gap between furnace crown and top of bridge, 12 to 14 ins.; over 7 ft. diameter—gap should be 14 to 18 ins. Firebridges built to a greater height than this are unnecessary and costly.

Fluctuation in Steam Loads

One of the greatest causes of loss of efficiency and costly steam generation is fluctuation in steam loads. Varying steam loads involve variation in firing rates, with consequent increased difficulties in maintaining efficient combustion, and losses due to smoke production, blowing off excess steam, etc. A well-proved remedy is thermal storage, whereby heat is stored at low-load periods for use at times of peak loads, thus permitting boiler plant to be operated at more uniform and economical loads. Steam storage principles may be applied on quite simple lines, and useful economies can be realised. The admission of excess steam at low loads to a tank of water which is drawn upon for boiler feed is a simple form of thermal storage and has proved of practical value in a number of cases; the steam may be admitted to the tank by manually controlled valves, or more automatically by setting an automatic valve to pass steam at a pressure, say, just below that of the boiler safety valves. This simple scheme can be improved in various ways, such as by providing better means of heat exchange between steam and water; a common improvement is to use an old Lancashire boiler for the tank, since this can be operated at a pressure of 20 to 30 lb., and the water storage capacity for steam is greatly increased in consequence.

Thermal Storage

Attention may be directed to a new system of thermal storage (the B.B.A. system), which is very readily and economically applied. A great advantage of this method is that it is possible to convert one of a battery of boilers into a steam accumulator simply by attaching a small loading apparatus to the boiler as shown in Fig. 3. If at any time the boiler is required for steam generation, all that is necessary is to close the inlet and outlet valves on the loading apparatus, with the added advantage that the water is already hot and the boiler can therefore be put on the line rapidly. Storage takes place on the variable pressure principle, surplus steam passing into the boiler at times of low load, and being released at times of peak load by the falling pressure in the accumulator boiler. At peak loads, therefore, a large reserve of steam is available owing to the pressure at which the boiler accumulator can be operated. This reserve steam, generated at low pressure, can be used in the food factory for process demands or operation of back-pressure sets, etc. Admission or withdrawal of steam takes place under either manual or automatic control. The system eliminates expense of providing large tanks, foundations, etc. In general, experience has shown that fuel savings from 5 to 15 per cent. can be obtained by application of thermal storage, depending on local factors such as extent of load variation, etc.

Cooling Losses in Shut-Down Boilers

It may sound strange, but substantial economies have been obtained in recent years by attentions designed to reduce heat losses when boilers are idle—*e.g.*, in the case of boilers which are shut down each night or week-end, or standby boilers held in reserve to meet peak loads. Tests have shown that boilers maintained idle with banked fires sustain heavy fuel losses. The air drawn through the furnace and flues absorbs heat from the brickwork and passes up the stack, being replaced by further atmospheric air, which in turn carries off more heat from the setting. This cooling loss has been found to be much more substantial than the heat loss by external radiation from the plant. An indication of this idle period cooling loss is given by the fall in boiler pressure commonly observed, but it does not form a measure of the amount of cooling, since some heat is given up by the brickwork and masks the full pressure drop which would otherwise take place. This heat loss—from the brickwork as well as the boiler and its water—has to be replaced before the boiler can operate at full working efficiency and economy. Careful investigations have confirmed that this loss of heat may be so heavy that many hours elapse before full thermal equilibrium is regained. In fact, instances are on record where boilers reached their full efficiency only an hour or two before they were to shut down again for the night. The result is considerable reduction in the average working efficiency throughout the day's operation.

In the past two or three years special designs of damper have been developed to give completely tight sealing of flues. One of these (shown in Fig. 4), which has already been applied on

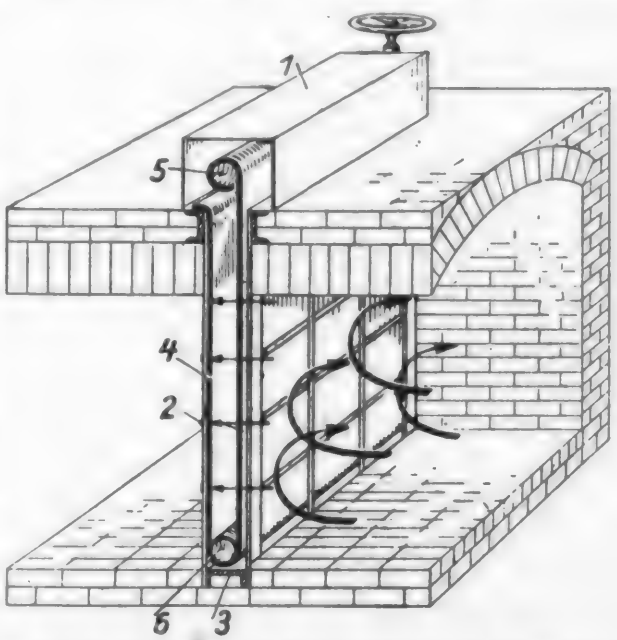


Fig. 4.—Special designs of damper have been developed to give completely tight sealing of flues. One is shown here.

several big power stations and in industrial boiler plant, consists of an asbestos curtain which is rolled into the flue duct from a roller. The flexible character of the material ensures a tight seal, since no leakage will develop due to warping of metal under the influence of heat. The idea behind such a damper is to keep furnace and brickwork sufficiently hot to restart fires rapidly, even after shut-down periods up to 14 hours or so. Banking fuel is therefore saved, and brickwork cooling is also prevented since the cooling air flow is stopped.

Economies Effected by Flue Sealing

An impressive list of economies can be tabulated for this equipment. At one works boiler plant 4 tons of coal were saved each week on the battery of five Lancashire boilers; another works showed a saving of 100 tons per annum; a large plant already operating at nearly 80 per cent. efficiency (and correspondingly difficult to improve) increased its efficiency by 3 per cent. and saved 300 tons of coal a year by similar methods.

Incidental advantages of importance should not be overlooked. Increased superheat temperature is obtained in the early hours of operation, since brickwork and constructional details near superheaters are not cooled in idle periods. In one case an increase of 15° F., and in another 18° F., resulted in the average superheat throughout the working day, indicating a much greater increase in the starting hours. Higher superheat means reduced steam demands by turbines, engines, etc., and reduced condensation and mains losses. Tight sealing also permits boilers to be shut down rapidly in emergencies such as air raids, and yet be put on load again quickly when work can be resumed. Experience shows that boilers can be started up in something like half the time compared with older damper designs; this feature is illustrated by Fig. 5. An example is provided by the case of a power station where a reserve boiler is put on load in a quarter of an hour after standing by for 7½ hours. Wear and tear of refractories is also reduced by elimination of the alternate heating and cooling involved in normal banking procedure.

Blowing-Down of Water

The blowing down of water to some extent is necessary with all boilers to control the saline and alkali concentrations in the boiler water, but serious fuel losses commonly arise due to improper control of this operation. The fuel loss due to blow-down, when no heat is recovered by interchangers, is easily calculated from the formula:

$$W = \frac{10\ B\ (T - 60)}{C}$$

where B is the amount of blow-down in gallons, T is the temperature of the water at boiler pressure, C is the calorific value of the coal used in B.Th.U. per lb., and W is the equivalent weight of coal in pounds. Individual boiler fuel losses are thus readily calculated. For general guidance it may be stated that a boiler operating at 200 lb. pressure loses heat equivalent to 270 lb. of coal for each 1,000 gallons of blow-down. A battery of boilers can thus quickly lose substantial amounts of fuel, especially if blow-down is excessive. The minimum blow-down required for individual boiler conditions can be determined from the formula $B = EF/C$, where B is the amount of blow-down in gallons required for each hour of boiler operation, E is the average rate of evaporation of the boiler in gallons per hour, F is the concentration of dissolved solids in the boiler feed in grains per gallon, and C is the maximum concentration of total solids which is to be permitted in the boiler water. These calculations are for average conditions, but give guidance which can be checked by periodical determination of boiler water density. Further fuel economies can be effected by passing the blow-down through some form of interchanger, where its heat can be given up to the cold boiler feed. Useful interchangers can often be purchased quite cheaply from works demolition people, and about three-quarters of the heat can be saved by reducing the blow-down temperature to 90° F. or so. Continuous blow-down systems are also available for purging a small amount of water from boilers as long as they are working. These systems are very economical, since they maintain the desired mineral concentration in the water, recover about 90 per cent. of the heat in the blow-down, and in many cases recover part of the blow-down in the form of condensate for return to the boilers.

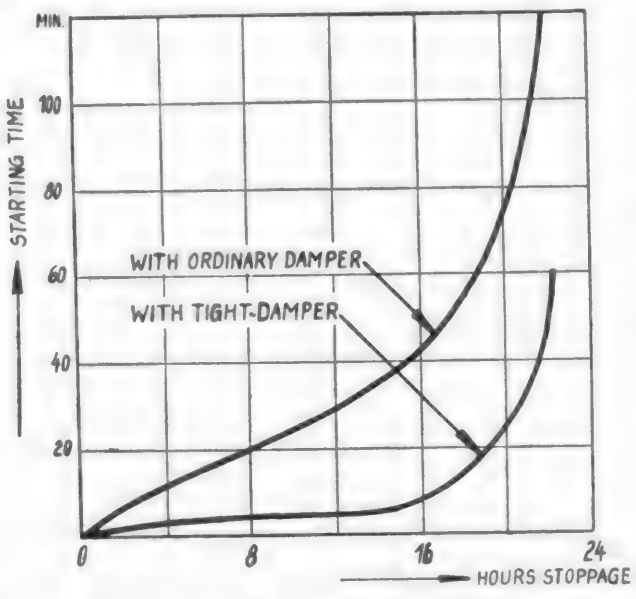


Fig. 5.—Tight sealing permits boilers to be shut down rapidly and be put on load again when work can be resumed. The effect of two kinds of damper is shown.

Insulation Work

It is generally recognised that substantial amounts of heat can be lost from unlagged hot surfaces, and the application of suitable insulating covering is widespread. Attention may be directed, however, to some important omissions quite commonly noted in insulation work. A significant fact revealed in research carried out some years ago was that the major part of the heat lost from unlagged surfaces occurred through the medium of convection; for instance, an unlagged ½-in. pipe lost 94 per cent. of its heat by convection, whereas it is general to speak of heat losses as *radiation* losses. Convection is the setting up of currents of air which pass over the heated surface and so carry away the heat. This point is important in connection with parts of the plant which are commonly overlooked.

Consideration of the nature of pipe flanges and their numerous bolts, the shape of valves, etc., will enable it to be realised that convection is facilitated at such points, and consequently substantial heat loss takes place at these items. Such items present a large total superficial area, accompanied by numerous surface irregularities which assist the movement of heated air. The practical importance of these considerations is confirmed by results of tests on heat loss from flanges, etc. Calculations from these test figures indicate that a modest-sized flange of 4-in. diameter loses heat costing £1 to £2 per annum, so that if one takes a modest estimate of 100 assorted flanges, valves, etc., on the steam system, operating unlagged, the loss mounts to the region of £200 to £250 per annum. A very useful saving is thus clearly possible by suitable insulation of such items. Special detachable boxes in half-sections in sheet metal are on the market for fitting at these points.

Other parts of the plant are also affected by this feature. The inlet and outlet headers of economisers present a great multiplicity of bolts, etc. In fact, several hundred square feet of total surface are involved on economisers, and under average economiser conditions the fuel loss will be of the order of 1 to 2 tons per square foot of surface per annum. Vertical areas, such as boiler front end plates, also facilitate convection currents being set up. Another common fault is to neglect small diameter piping while large mains are lagged; small piping presents more surface in relation to capacity, and loses a greater proportion of heat in consequence. Finally, one should note that lagging of valves, flanges, etc., will maintain these items at a more uniform temperature, which will assist in combating leakage, with its cost in loss of steam and increased maintenance work.

FOOD MANUFACTURE INDEX FOR 1940

THE 1940 index of FOOD MANUFACTURE is still available, and copies will be sent to subscribers on receipt of a stamped addressed envelope. This envelope should be 10 inches by 8 inches to avoid undue folding of the Index.

POPPY SEED OIL

H. STANLEY REDGROVE, B.Sc., F.I.C.

JUST over two years ago I contributed an article to FOOD MANUFACTURE (Vol. 14, 1939, p. 24) deploring the neglect of poppy seeds by the bakery and confectionery trades in this country. It was written primarily from the point of view of the gastronome—by one who, having sampled poppy seeds in various combinations, had found them very good indeed.

To-day poppy seeds assume a position of new importance, owing to the high yield of fixed, edible oil that can be obtained from them, this yield being in the vicinity of 50 per cent.

Scarcity of Oil-Yielding Plants

Great Britain is not rich in oil-yielding plants, and has to depend very largely on imported fixed vegetable oils to meet her requirements. Linseed oil is of limited utility owing to its unpleasant flavour. Hemp- and rape-seed oils require considerable refinement. The seeds of the sunflower *Helianthus annuus* L. might be worthy of closer attention, and certainly this should be bestowed on the opium poppy *Papaver somniferum* L. as a valuable oil-yielding plant.

Dr. R. Melville, of the Museums of Economic Botany, Royal Botanic Gardens, Kew, deals with the subject in a very informative manner in a recent issue of *The Gardeners' Chronicle*, and enters a strong plea for the wider cultivation of suitable strains of the opium poppy in this country.

It needs to be emphasised that when the opium poppy is cultivated in a temperate climate it produces little, if any, opium, and that, in any case, and wherever grown, the seeds and the oil derived therefrom contain no opium and are quite destitute of any narcotic principle.

Indeed, the oil, more especially in view of its pleasant nutty flavour, is one admirably adapted for edible purposes. In France, which prior to the war took a large proportion of the poppy seed produced in India, the oil is used not only for making artists' paints, but also as an esteemed salad oil.

The oil is a drying oil—in other words, is rich in glycerides of unsaturated fatty acids. According to the results of an analysis by Eibner and Wibeltz, quoted in the previous contribution on poppy seeds, the fatty acids present in the oil as glycerides are: oleic acid 28·3 per cent., *alpha*-linoleic acid 29·5 per cent., *beta*-linoleic acid 29 per cent., and saturated fatty acids (chiefly palmitic and stearic) 7·2 per cent. This high proportion of unsaturated fatty acid glycerides should render the oil very amenable to hardening by means of catalytic hydrogenation, and hence of definite interest in the manufacture of margarine.

Yields of Oil

According to figures published in the third edition of *The Handbook of Commercial Information for India* (New Delhi, 1937), in India—where cultivation of the opium poppy is restricted to the United Provinces and the Punjab hills—the yield of seed (at 70 per cent.) per acre is only about 20 lbs. But it must be borne in mind that the plant is cultivated primarily for opium, and dark-flowered varieties produce very small seed capsules.

Macmillan, in his standard work on *Tropical Gardening and Planting*, gives 4 cwt. as the average yield of seed per acre, a figure also suggested as an average figure by Dr. Miller.

When grown for seed, it should be practicable to set the plants 12 inches apart in rows 12 inches apart. This would give nine plants per square yard, or 43,560 plants per acre. Assuming each plant to produce only a single capsule, containing on an average ½ oz. of seed, a yield of over 6 cwt. of seed might be reasonably expected. With careful cultivation this ought to be surpassable and a yield of 3 cwt. of oil or more per acre obtained—a figure which is definitely attractive.

Poppy cultivation has never assumed important proportions in this country, and when grown at all the opium poppy has usually figured only as a decorative garden subject.

It may be that the matter will be taken up seriously as a result of Dr. Miller's appeal. Care in cultivation is necessary, as the plant is one singularly subject to variations, which sometimes occur for reasons which are entirely obscure. Choice of seed of suitable strains is essential, special preference being given to white-flowered forms or varieties producing large capsules and abundant seed.

The oil, after cold expression and refinement, should find a ready market among manufacturers of margarine and other food products, while oil obtained by a second hot pressing could no doubt be absorbed by soap manufacturers.

Efforts should be made to popularise the seeds among bakers, confectioners and housewives. Now that so many normal items of the British diet are becoming short and difficult to obtain, consumers are more amenable to dietetic innovations, and there should be no difficulty in connection with this innovation, owing to the very agreeable flavour of the seeds. But it might be policy, as suggested in my previous contribution on the subject, to find a new name for them. "Poppy seed", to the half-educated, suggests "opium", while "maw seed" suggests food fit only for cage-birds.

Some Uses for Poppy Seeds

Made into a paste with honey, poppy seeds form an excellent filling for pastry, a filling which satisfies the craving for sweet foods and is also very nutritious, but obviates entirely the use of sugar. Sprinkled on bread and marmalade or jam, the seeds might well take the place of butter or margarine, at once improving the flavour and helping to supply the body's need for fats.

The seeds should be found equally useful in cake-making, while for the oil almost innumerable uses might be found. It would certainly supply the need for a salad oil which is entirely home-produced, and equal in dietetic value to olive or arachis oil.

I am convinced that in suggesting the wider cultivation of the opium poppy in this country Dr. Miller has put forward a proposal of first-class importance towards solving one aspect of the nation's present pressing food problems. Food manufacturers can certainly help, firstly by forcefully endorsing the project, and secondly by utilising the home-produced seeds and oil if and when they become available.

INDUSTRY IN WAR-TIME

THE following is an abstract from a report issued by Jordan and Sons, Ltd.:

Company Registrations in 1940—the first year of total warfare—reflect the determination of the country to carry on essential industry.

Of the 6,084 companies registered, no less than 706—over 11 per cent. of the total—were formed to carry on some engineering process, whilst in the previous year the "engineers" registered only 8 per cent. of the total. Munitions come first!

The third highest category is the "food" class with 552 companies (9 per cent. of the total), which percentage is again higher than that in 1939 (8 per cent.).

The men of the Services and the workers are provided thus with weapons, clothing and food. Non-essentials, however, are being eliminated, accounting for such low figures for motors, cinemas, furniture and sports.

Industry is willingly submitting to the discipline of the Limitation of Supplies Act, the Purchase Tax, and the various controls established by the Board of Trade.

The fact, however, that in this year of total warfare, and despite the conditions of their birth, no fewer than 6,084 companies were born, is a rare tribute to the energy and enterprise of the British business man. On the industrial front he adjusts himself to changed conditions no less vigorously than the fighting commander on the battle front.

Government control of the distribution of food, which commenced in 1939, and was greatly extended in 1940, gave rise to several guarantee companies for carrying on duties imposed by the Ministry of Food.

Notable food companies were: Associated Tripe Dressers, Ltd.; Olive Oil Importers Association, Ltd.; Animal Feeding Stuffs C.I.F. Buyers Association of London, Ltd., with similar companies for Liverpool and Hull; "Grow More Food," Ltd.; the Association of Animal Gut Cleaners, Ltd.

We note the remarkable figure of 92 new shipping companies, which is nearly as high as in 1939, when 111 companies were formed.

Every help has been given by the Government to exporters, and, indeed, they are backing companies created specifically for the export drive.

The United Kingdom Commercial Corporation, Ltd., with a nominal capital of £500,000; the United Kingdom Commercial Corporation (Spain), Ltd.; the Arctic Trading Corporation (£500,000 capital); the Marks and Spencer Export Corporation—these and others are building up the foreign exchange balances with which to finance munitions purchases.

Noteworthy private food companies not already named were: Brown and Harrisons Dairies, Ltd., £225,000; A. H. Parker and Sons (Great Britain), Ltd., £100,000.

THE PASTEURISATION OF SKIM MILK AND WHEY BY DIRECT STEAM INJECTION.*

A. T. R. MATTICK AND W. A. HOY
National Institute for Research in Dairying, University of Reading.

A SERIES of tests has been made to determine the bactericidal efficiency of an adaptation of the plate type heat exchanger for the pasteurisation of dairy by-products before return to the farm for stock feeding. .

There is reason to believe that great benefit would follow the universal use, not only of pasteurised by-products for pig feeding, but also of pasteurised milk for calf feeding, as the infection from the dam with tuberculosis, mastitis, abortion, and other diseases would cease. The advent, therefore, of a cheap and simple process of pasteurisation is to be welcomed. The principle of the new process is the direct injection of steam into the product as it leaves the regenerative section of the heat exchanger. This causes an immediate rise in temperature which is maintained for about 3 secs. in a short " holding " pipe, after which the product returns to the heat exchanger. The processing temperature is recorded by a bare mercury-in-glass thermometer at the end of the holding pipe.

Treating Milk for Animal Consumption

In treating milk or milk products for animal consumption the objects are similar to those of the pasteurisation of milk for human use—*i.e.*, there must be a maximum destruction of organisms causing spoilage, minimum damage to the total nutritive value, and, above all, pathogenic organisms, especially *Mycobacterium tuberculosis*, must be destroyed.

The dilution of the product with water (about 3·5 per cent.) is of no practical significance in animal feeding. In the destruction of micro-organisms by heat a time factor is also involved, and it is worth mentioning here that increasing the rate of flow would shorten the holding time and correspondingly higher temperature would be required for pasteurisation.

The rate of flow at the beginning of each test was adjusted to 400 gallons per hour, the plant being run on water for about 30 minutes to stabilise conditions. All samples were taken on a descending temperature.

Tests with Commercial Skim Milk

Tests with commercial skim milk and whey were designed to find the temperature required for the following : (i) the destruction of the general flora, including coliform organisms (46 samples at different temperatures from 9 trials); (ii) the destruction of phosphatase (16 samples from 4 trials); (iii) the destruction of bovine tubercle bacilli (10 samples from 2 trials); and (iv) the destruction of peroxidase (6 samples from 1 trial).

The skim milk used for observing the destruction of *M. tuberculosis* was artificially infected with the growth from cultures of known bovine type. The growth was first thoroughly emulsified and then added to the milk at the rate of 3 mg. of original moist growth per gallon.

The results of the tests showed that considerable numbers of organisms of the general flora survived at 140° F. At 160° F. coliform organisms could not be recovered, but the general plate count was still high. At 170° F. the reduction in the numbers of the general flora and coliforms was excellent.

At 164° F. there was little destruction of the phosphatase; at 165° F. and 166° F. there was definite destruction, but the tests were still positive. At 168° F. and higher the tests were definitely negative. The milk that had been heavily infected with *M. tuberculosis* was tested after treatment at 163° F., 164° F., 165° F., 168° F., and 170° F., and in all cases the inoculated guinea-pigs were free from infection when killed 9 weeks later. All controls were positive.

Samples of skim milk after heating at 185° F. gave a negative Storch test.

Conclusions

The evidence on the destruction of the general flora, including coliform organisms and *M. tuberculosis*, suggests that heating at 170° F. (the temperature being recorded at the end of the 3 secs. holding) would be satisfactory, but to meet possible fluctuations in practice 175° F. is recommended. Where the Storch test is in official use heating should be at 187° F.

* *From the Proceedings of the Society of Agricultural Bacteriologists (Abstracts).*

CANADIAN CANNED SARDINES

DUE to the curtailment of Continental supplies, a demand for Canadian sardines is developing in the mid-western states of the United States, according to a report received by the Department of Trade and Commerce from G. R. Heasman, Canadian Trade Commissioner at Chicago. Mr. Heasman states that this is shown by the number of enquiries it has received.

Wholesalers and brokers state that Canadian packers of sardines should be able to obtain some of the market at the present as Canadian sardines are considered as of the same quality as those put up in olive in quarter tins by Maine packers, and the demand for the Maine product is growing.

The report states further that " there seems to be little call for the cheaper type of sardine, and the demand is consistently for one packed in a good grade of olive oil. The fish should be small, say from 15 to 22 per tin. The smoked sardine is apparently most desired, as it most closely resembles the Norwegian pack. Dealers are of the opinion that Maine packers at the present time are not putting the smoked sardine similar to the Norwegian product, and this is one of the reasons why Canada should be able to obtain part of the market with a smoked product ".

Notes on Manufacture of Jam and Marmalade

(*Continued from page* 104)

much as 1 or 2 tons per batch), the bulk is not greatly affected by the presence of small quantities of tough, unripe fruit or soft, over-ripe fruit, and the variation of quality from batch to batch of the finished pulp is slight. Variations in quality of the fruit in bulk do occur as the season advances, but such variations are easily countered by slight adjustments to the time of cooking.

The fruit is usually cooked in large wooden bunkers and stored in casks. This method of storage means that the pulp retains its heat for some considerable time, and in the case of some soft fruits this would tend to cause further breaking up of the fruit. In such cases the fruit can be put into casks uncooked, or the hot pulp can be cooled before running into the casks.

The most convenient method of preserving large quantities of fruit pulp is to add sulphur dioxide in the form of a concentrated solution. The quantities used vary with the fruit, but for most fruit pulps a sulphur dioxide content of 0·10 to 0·15 per cent. is satisfactory.

The chief difficulty in the manufacture of jams from fruit pulp arises from the preservative added to the pulp. Sulphur dioxide has a tendency to form relatively stable compounds in the skins and seeds of certain fruits, and these compounds are broken down only by very prolonged boiling, or by boiling in the presence of a strong acid. Consequently, while most of the sulphur dioxide is easily removed in the boiling, there remains a small quantity which is very difficult to remove in the boiling of jam, but which is easily determined by the analyst. Since the regulations allow sulphur dioxide in jam only up to 40 parts per million, this " stable " sulphur dioxide in the pulp often proves to be a serious difficulty to the jam manufacturer.

These stable compounds are formed quite slowly in the fruit, and pulp which is only one or two months old usually gives no trouble at all. But with pulps which have been stored for six months or more, and particularly with raspberry or blackcurrant pulps, it will be found necessary to add extra water to the boiling in order to bring the sulphur dioxide content of the jam below 40 parts per million.

In prolonging the boiling this will cause more breaking up of the fruit and will tend to produce a jam lacking in whole fruit and weak in set. The set can be improved easily enough by the addition of pectin to the boiling, but the fruit can be kept whole only by keeping the added water down to a minimum.

The manufacture of marmalade consists of two distinct stages : the preparation of the pulp and the preparation of marmalade from the pulp.

In the preparation of orange marmalade pulp the fruit is first peeled, then the skins are cut into thin chips and washed, while the hearts are cooked. In the process of cooking the hearts are reduced to a pulp, which is further smoothed by being brushed through a sieve just fine enough to hold back the pips. From this point onwards the process varies, according to the type of flavour required in the finished marmalade, or if the pulp is required for immediate use or for storage for future use.

In the actual preparation of the marmalade the chief difficulty arises from the fast rate of setting, and this must be carefully controlled if the finished marmalade is to have a good clean gel.

NEWS FROM THE INDUSTRY

Exporting Vitamins

Under a Board of Trade Order, which came into force on April 24, 1941, electric insulated (other than paper-insulated) wire and cable, electric cable-making machinery, wire drawing, and wire and cable insulating and covering machinery are among articles which may not be exported to any destination without an export licence.

The Order (S.R. & O., 1941, No. 492) also prohibits the exportation without licence of certain vitamins, vitaminised oils and emulsions and mixtures thereof, mixtures containing sulphur, wireless receiving valves, and certain mica manufactures and vegetable tanning materials to all destinations; and of cable, rope, cordage and twine of hard hemp, card clothing, paper-insulated electric wire and cable and insulating materials containing mica to certain specified destinations.

* * *

Export Control of Foodstuffs

Under a Board of Trade Order signed on March 19, which came into force on April 3, certain additions are made to the Export Control List as a result of which practically all foodstuffs will be subject to export licensing control to all destinations. The chief exceptions are wines, spirits, pickles, sauces and chutneys.

The principal effect of this Order is to extend the existing control on exports of meat, fruit, vegetables, milk, sugar and molasses, etc., and to cover edible or potable preparations made wholly or partly therefrom.

The Order also prohibits the export without licence of gelatine and lecithin (including mixtures of lecithin and oil or fat).

The concession under which, with certain specified exceptions, foodstuffs which are subject to Export Control may be exported without licence to the Crown Colonies and Protectorates, provided that an import licence has been obtained in the territory concerned, will remain in force.

The Order, S.R. & O., 1941, No. 355, is available at H.M. Stationery Office.

* * *

Controller-General of Factory and Storage Premises

A short time ago it was announced that the Government had decided to set up a Central Control of Factory and Storage premises through which the requirements of all Government Departments would be co-ordinated.

The President of the Board of Trade has now appointed Sir Cecil Weir, K.B.E., M.C., to be Controller-General of Factory and Storage Premises. Sir Cecil Weir, who is a member of the Industrial and Export Council, will take up his duties shortly, and a further announcement will then be made with regard to the central and regional organisation of the Control and the date from which it will operate.

Horse Meat

Messrs. T. W. Mays and Sons, Ltd., of Bourne, have commenced the slaughter of horses for human consumption, and are slaughtering more than they did before the war. After the animals have been killed the carcases are examined by Mr. J. S. Fisher, meat inspector to the Bourne Urban Council, and all the meat is removed from the bone before being dispatched to London, says the *Grantham Journal*.

The scheme was launched recently, and something like five tons is being used in this way weekly. If the firm could obtain more horses for slaughter they could dispose of a much larger quantity. When war broke out the outlet for horse meat was closed, and the whole business of slaughtering was discontinued until a few weeks ago. During the intervening period Messrs. Mays made many endeavours to find an outlet for the meat, and their persistence was rewarded when proposals were made to them that horseflesh should take the place of chicken and ham galantine, which became impossible to obtain owing to rationing.

The meat is dispatched to a factory in Barking, and with each supply there is a certificate stating that it is free from disease and fit for human consumption. Every stage of the manufacture of the rolls containing the horse meat is carefully watched, and local food inspectors visit the factory three or four times a week. The roll is put into tins of 2¼ lb. and 3 lb., and the majority of it is sent to the North Country and the Midlands. On the surface of each tin there is a label bearing the words, "Meat Roll. Contains Horse Meat," and the retailer is supposed to inform the customer what the rolls contain. The rolls in which the meat is used also contain ground wheat rusks and seasoning.

* * *

Industrial and Export Council

The following additional members have been appointed to the Industrial and Export Council:

The Right. Hon. Lord Portal, D.S.O., M.V.O., Parliamentary Secretary, Ministry of Supply.

Mr. George Tomlinson, M.P., Parliamentary Secretary, Ministry of Labour.

Sir Nigel Campbell.

Mr. Charles Dukes, National Union of General and Municipal Workers.

Mr. C. U. Peat, M.C., M.P., Parliamentary Private Secretary to the President of the Board of Trade.

Mr. M. Watkins, Managing Director, John Lewis, Ltd., London.

The above members have consented to serve also on the Committee of the Council, which, as announced by the President of the Board of Trade on March 4, has been appointed to assist in the concentration of industries. The following members of the Council are also members of the Committee:

Mr. F. D'Arcy Cooper; Mr. S. R. Beale; the Right Hon. Lord Forres; Mr. M. Hodgson, O.B.E., J.P.; Sir Cecil Weir, K.B.E., M.C.

Dairy Plant and Equipment

The Ministry of Food warns all manufacturers and distributors in the dairying industry that, in view of the need for drastic enonomy in the use of steel, no applications for licences to obtain steel for the manufacture or repair of dairying plant or equipment will in future be considered except in cases of urgent national importance. It is hoped that distributors and manufacturers will recognise the necessity for making alternative arrangements wherever possible and will refrain from submitting applications for licences, which can only be refused.

In cases where the renewal or extension of plant or equipment cannot be deferred, requirements of steel should be reduced to an absolute minimum. Full details must be submitted, including the weight of steel required in tons, hundredweights and pounds.

* * *

Service Pay of Civil Servants

A point of Lord Perry's speech at Foyle's Literary Luncheon recently on the subject of "Beware Bureaucracy" was that Civil Servants who joined the fighting Forces were paid more money out of the public purse than those who were not employed by the Government. Mr. W. J. Brown, on behalf of the Civil Service, admitted that the pay of the Civil Servants in the Forces was made up to the amount of their peace-time salaries. Any other citizen, Lord Perry said, had with his family made considerable sacrifices for the country's defence, relinquishing his employment and peace-time position and salary to join the ranks at the uniform rate of pay of 2s. 6d. per day as settled by Parliament. He, unlike the Civil Servant, had to depend upon "charity", when it was available, to maintain his pre-war social status.

Lord Perry referred to the thousands of what he called "highly paid apprentices" in the Civil Service working long hours in an endeavour to obtain a glimmer of understanding of the new subjects which had been presented to them. He said that the Civil Servant was expected to move from Education to Eggs or from Milk to Munitions—to be, in effect, a war-time "Jack-of-all-trades".

He called attention to the wilful neglect by Parliament, who had delegated the law-making to the bureaucrats, and warned his audience of the potential danger which existed at present in the building up of a Frankenstein monster of bureaucracy which was likely to take the power and crush the democracy which had built it.

* * *

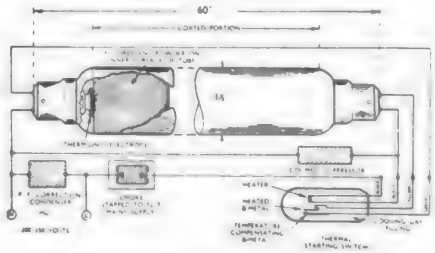
Mr. R. J. Low

Mr. R. J. Low, M.I.Chem.E., A.M.I.Mech.E., late Chief Engineer of Howards and Sons, Ltd, Ilford, joined Fredk. Boehm, Ltd., on April 1, 1941, and is now acting in a similar capacity for them and their associated companies.

A New Fluorescent Lamp

It is claimed by the British Thomson-Houston Company, Ltd., that their new Mazda 80 watt 60" fluorescent lamp has revolutionised lighting and that it will oust other forms of lighting in a comparatively few years.

The light from the lamp approximates closely in quality to June sunlight, a fact of considerable importance in these days of black-out. Although the lamp has many applications the demand is such that precedence must be given to industrial lighting. The Company has already been responsible for a great many installations to the satisfaction of executives and workers.



Although the lamp, strictly speaking, is a low-pressure discharge lamp calling for control gear, usually in the form of a choke, from the point of view of operation it functions very largely like the tungsten lamp, that is to say there need only be a time lag of a second or so between switching off and on again. The colour of the light from this lamp is constant, depending solely on the fluorescent materials used for coating the tube. Variations in voltage affect the quantity, not quality. The diagram shows the essential details of the lamp and its circuit.

* * *

The Truth about Rats

We have received a beautifully produced booklet published by the British Ratin Co., Ltd., and written by Mr. K. G. Anker-Petersen, managing director of the Company.

Many alarming figures are given for the damage done by these rodents. It is computed that no less than 99 million pounds sterling worth of damage is done annually by rats and mice in food alone. Apart from this, wanton damage to woodwork, electric cables, etc., accounts for as much more. The contamination of the food of man, with consequent infection of disgusting diseases such as bubonic plague, trichinosis, etc., is another consequence of the work of rats.

The cunning of the rat is proverbial, and man in his perpetual war against it has made each generation more elusive than the last. After years of research, the Company has succeeded in finding a way of overcoming suspicion known as the Ratin system. It does not kill the rat until about nine days after it has been consumed. After the first week the rats begin to die and in three or four weeks the whole colony is affected. The service rendered by the Company is nation-wide and clients are serviced by experts in each district, who will give advice on infestation problems.

The Ratin Service undertakes treatment on an annual contract basis. The booklet includes copious testimony of satisfactory work undertaken and should be read by food factory executives.

* * *

Vitamin Capsules

A vitamin scheme for employees worked out by Abbott Laboratories (England), Ltd., has received the support of the works medical officers and visiting physicians of many well-known firms, the idea being to provide employees, through the welfare department or ambulance room of works, with handy cartons of Haliver Oil Capsules, each one of which contains 8,500 I.U. of vitamin A and 150 I.U. of vitamin D. The capsules are put up into handy cartons of 28, sufficient for a fortnight with a daily dose of 2 capsules. These are supplied at the low price of 1s. each, the foreman of each department collecting the money from each employee who is participating in the scheme.

In some industrial concerns the employee pays the total cost, in others the employer and the employee each pays half the cost, and again in some instances the employer pays the total cost. The Company supplies firms with leaflets, explaining briefly and clearly some facts about vitamins A and D, for distribution among work-people.

* * *

Essential Oils

"Markets for the most part continue to advance, and supplies of many essential oils and allied products are becoming increasingly difficult to obtain," say Stafford Allens in their market report for April. "Not only is the restricted import quota affecting the supplies, but it is becoming increasingly difficult to obtain shipping space from both the East and the West for essential oils on account of the increasing flow of armaments and other raw materials being shipped to this country. We cannot see the position becoming easier, and the amount of essential oils allowed into this country during the next six months will probably be very considerably less than in normal times. There continues to be an active demand for many of our products, and at the present time we are more busy than ever before.

We express apologies to our customers who have not been getting immediate delivery, but with shortage of labour and an enormous number of orders to deal with, our despatch departments are somewhat behindhand. They hope, however, to catch up shortly, and we shall then be in a position to make our usual immediate deliveries."

* * *

Scientific Instruments

Science is playing a more important part in this war than in any other war in history. The development of the maximum war effort is assisted by the manufacture of instruments of the modern type essential to modern science. Many recent forms are listed in the latest catalogue issued by Griffin and Tatlock, Ltd., and other newly developed improvements are described in a series of leaflets which we have received. Among some interesting items figure the following: Fuel Sampler; Automatic Pipette; Gas Generator and other British-made apparatus which was formerly supplied largely or exclusively by Germany.

* * *

Filling Machine

A rotary type volume filling machine for handling free-flowing materials at a high speed with a good degree of accuracy (with the smaller quantities speeds up to 60 per minute are possible) is now being made by the Automatic Weighing and Packing Machine Co. Different sizes to cover various ranges of weight can be supplied, with special applications for handling of peas, beans, etc., for canning plants.

The machine is supplied with "built-in" motor for driving. Construction and erection are very simple, thus showing a great advantage over hand- and treadle-operated machines.

* * *

For a number of years Prodorite, Ltd., Industrial Flooring Specialists, have realised that the demand for good flooring has gradually increased, and have therefore developed a very complete range of industrial floor surfaces, acid-proof and non-acid, which they know from years of test and practical experience will be satisfactory for the particular work for which they are recommended.

It is contended that it is a very short-sighted policy for a firm merely to put down any kind of floor and hope for the best when, by consulting a firm of long, specialised experience, the proper surface can be put forward with the assurance that long, useful life will be obtained from the initial expenditure.

The picture shown here illustrates a floor installed in the green-fruit department of a large wholesale store. This floor is comprised of steel-faced ferrogran flags. These flags are made to meet the heaviest conditions of wear; are waterproof and non-dusting. They are made in squares, size 12 in. by 12 in., which makes them simple to handle and easy to fit.

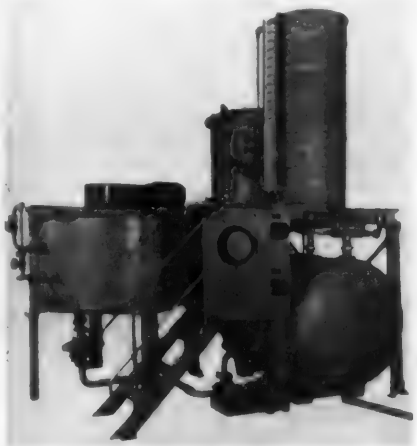
Sugar Dissolving, Decolorising and Filtration Plant

The main object of this plant is to enable the preserve manufacturer to use a cheaper grade of sugar, and by dissolving this in water, then decolorising and filtering same, it is ready for supplying to the boiling pans.

The illustration shows the Dissolving Pan on the left, with the Water Pre-Heating Tank and Glucose Tank mounted on the platform above the Receiving Drum.

The pump for carrying the sugar syrup from the Dissolving Pan to the Receiving Drum can be seen on the floor under the latter.

The output of this plant is 15 tons sugar per day.



This plant is made by Brierley, Collier and Hartley, Ltd., whose London offices have been recently destroyed by enemy action, although all records had been previously removed. The company's new address is: "Sunridge", Ruden Way, Epsom Downs, Surrey. Telephone No. 2749.

* * *

Factory Carries On

The factory of a Glasgow firm of chocolate manufacturers was damaged during the recent air raids on Clydeside. The firm employs 150 girls, and they all reported for work at 8 a.m. on the morning following the raid, although many of them had left homes which had been damaged.

The moulding-room of the factory was destroyed, but the 1941 crop of Easter eggs are being made under fresh-air conditions. The girls employed in the moulding-room felt that to wait for official salvage would hold up production, so they burrowed among planks and plaster for the metal egg moulds, rescued trays and bowls, racks and piping apparatus from the débris, and scoured them clean. Fifty tons of cocoa beans, butter and other ingredients were also salvaged, and machinery which escaped damage was set in operation.

* * *

Mr. M. C. Hives

Mr. M. C. Hives has been appointed Sales Manager of Fischer Bearings Co., Ltd. Mr. Hives has been connected with the Fischer organisation for the past seven years.

Protection of Vital Plant

A recent development of Andamite, Ltd., is a canopy unit for the protection of vital plant in factories. Constructed of ¼-in. Durasteel sheets, this type of unit is being adopted by a number of factories owing to the effective protection it gives against blast, débris and fire. The firm has recently been approached with a view to redesigning their standard "Raidsafe" shelter for use as a fire-watchers' post. As this is a considerably stronger structure than the average type of fire-watchers' post it gives a greater protection against blast and splinters and yet is easily movable and will extend to accommodate any number of persons.

* * *

Fire Extinguishers Mobilised

Hundreds of thousands of hand fire extinguishers already installed throughout the country are being mobilised to meet the war fire danger. This important news is announced in a memorandum issued by permission of the Ministry of Home Security by the Fire Extinguisher Trades Association.

Recent Ministry of Home Security official tests proved the soda-acid type and the water and compressed CO_2 type extinguishers to be highly effective on both the incendiary bombs and fires caused by them.

An outstanding advantage of these hand extinguishers is that they can be operated single-handed. This is of great assistance to fire bomb fighters. No physical exertion is needed; the extinguishers are usually operated simply by striking a knob or being turned upside down. They are generally of two-gallons capacity, and it is estimated officially that three-quarters of a gallon is required to deal with the bomb itself, leaving about one and a quarter gallons for any resultant fires. Such extinguishers are usually installed in buildings at sufficiently frequent intervals to permit more extinguishers to be brought into action quickly to follow up the use of the first one, should this be necessary.

Fire extinguisher manufacturers are now able to supply dual nozzles for extinguishers already installed. Owners of extinguishers are advised to make sure that their extinguishers have been serviced recently and recharged if necessary.

* * *

Changeover to New Lines

Perhaps the most significant aspect of the present situation to the canners must be the havoc which war has played with their established position in the public market. This thought is prompted by the fact that in a large Scottish centre few, if any, retailers could supply any of the famous lines which held this market a few months ago. Instead strange new unfamiliar cans are being seen on the shelves of the food retailers, Empire brands, strange foods in strange packs. The public, glad to buy anything, are taking these—and, moreover, finding them good. If these Empire brands can hold this war-time market there would appear to be a big canned food battle on the horizon.

OBITUARY

Mr. Francis Edwin Brown

It is with great regret that we have to record the death of Mr. Francis Edwin Brown, Chairman of Messrs. David Brown and Sons (Huddersfield), Ltd., and its associated companies.

Mr. Brown, who was 67 years of age, was well known throughout the engineering industry in many parts of the world. He first joined the company, which was founded by his father in 1860, as an apprentice in January, 1889, and the business of David Brown and Sons in its present form was originated by him.

He was a pioneer in the development of machine-cut gearing, which was a logical outcome of the first machine the company had designed and made for them for cutting teeth in the wooden gear patterns in which they at that time specialised.

He was wholeheartedly behind any national efforts, and in the crises of 1914 and 1939 the companies under his direction spared no pains to make their maximum contribution to the country's struggle.

Mr. Brown was a well-known figure at the Motor Shows from their earliest days when the firm became members in 1906. He was President of the Huddersfield Engineering Employers' Association in 1921 and 1922, and the first Chairman of the Huddersfield Branch of Foremens' Mutual Benefit Society.

His passing leaves a gap in the engineering world that will be hard to fill.

* * *

Mr. A. E. Bartlett

Mr. A. E. Bartlett, for many years foreman to Mr. Wilfrid Andrews—mineral water manufacturer of Newbury—has died. He was for some years assistant manager of the mineral water department of Strong's Brewery and was an expert on the appropriate machinery and all power equipment.

* * *

Mr. Augustus George Wiggins

We regret to record the death of Mr. Augustus George Wiggins, for many years the County Dairy Officer for Hampshire.

The Royal Institute of Public Health and Hygiene

The Annual Report of the Royal Institute of Public Health and Hygiene demonstrates how the Institute proceeded steadily along its appointed path during 1940 in spite of unforeseen disturbances and unusual difficulties, which may probably increase rather than diminish. What the immediate future will bring forth cannot be visualised, but it would appear that the Institute can look forward to a full programme of work, for times of stress inevitably call for a greater effort on the part of the individual to maintain his or her own personal health, and on the part of the community to ensure that its manifold public health services function as completely and efficiently as possible. It is in propaganda work on the health of the community that the Institute expends considerable time, and it is confidently expected that Fellows, Members, and Associates will continue to assist by spreading abroad the gospel of hygiene. Communal health, on the other hand, is generally considered as being outside the sphere of the individual hygienist, and as far as the provision of a supply of pure food, water, and milk, the maintenance of a satisfactory system of sanitation, the control of infectious disease, and the organisation of general social and public health services is concerned this is true, but he can play a useful part in persuading people to take the fullest advantage of these services, than which there are none better in the world.

* * *

Egg White Solids

V. Conquest, of the Armour and Company Research Laboratories, describes a method for making a special quality of dried egg albumen. The efforts to create different grades of egg albumen by measuring the volume of foam obtained with a given amount of albumen and water and a standard time of whipping were not satisfactory, the buyer being always at the mercy of the seller, as these tests left so many factors out of consideration, such as odour, colour, moisture, absorbability, stability, coagulability and cell structure.

The process gives a stable, pure white, powdered egg solid, and it is claimed that this new product is lower in moisture content, yet readily and completely soluble, while the putrid odour is completely eliminated. "It absorbs a greater ratio of moisture and produces strong air cells of small uniform size that are closely knit together when whipped. It also gives greater whipping volume in the batch, and, being a standardised uniform product, it comes in only one grade."

This egg white product has been evolved by speeding up manufacturing processes with a modern spray-drying equipment so fast that decomposition of the protein matter in the egg white cannot take place.

Apparently this product is much more satisfactory in the manufacture of confectionery, giving a much lighter texture to such lines as marshmallow, nougat, etc., while the hours of soakage necessary with albumen are entirely eliminated.

Divisional Food Organisation

The Minister of Food has made the following promotions in the Divisional Food Organisation:

Mr. E. Hill-Snook, Deputy Divisional Food Officer, to be Divisional Food Officer, South Wales Division.

Mr. R. Hutchinson, Deputy Divisional Food Officer, to be Divisional Food Officer, North Midland Division.

* * *

Change of Address

We are advised of the following change of address: Export Credits Guarantee Department, Third Floor, North-West Wing, Bush House, Aldwych, W.C. 2. Telephone number: Temple Bar 7622. For the convenience of exporters, however, a branch of the District Office will be maintained at the Department's Head Office, 9, Clements Lane, E.C. 4.

* * *

The United Glass Bottle Manufacturers, Limited

Among the matters discussed in a statement by the chairman, Sir Max J. Bonn, to the shareholders of the United Glass Bottle Manufacturers, Ltd., were the following: "The net profit for the year shown in the accounts is £236,345 (as against the previous year £248,443), to which is added the balance from last year, £41,096. After making various allocations, to which I shall refer later on, there remains available for distribution £193,251.

"The dividend for the year, less income tax on the Preference shares, £51,809, and an interim dividend less income tax on the Ordinary shares, £22,480, has been paid, and it is proposed to pay a final dividend on the Ordinary shares of 6 per cent. less income tax, making 9½ per cent. for the year (same as last year) and a cash bonus of 2½ per cent. less income tax (same as last year) £54,594, and to carry forward a balance of £64,368.

"As regards the allocation of the net profit shown, those for debenture sinking fund, staff benevolent fund and air-raid precaution expenditure require no special comment.

"Rather than add to general reserve, we have allocated £25,000 to contingency reserve and have increased the carry-forward by £23,272. We would ask you to regard this liquidity as an indication of the many uncertainties which may affect our production. So far, however, we have worked quite satisfactorily and in accordance with our anticipations, which envisaged some shrinkage from the abnormally high level of our general business during the last few years."

* * *

Wm. P. Hartley Dividend

Wm. P. Hartley, jam manufacturers, proposes paying a dividend of 8 per cent., less tax, for the year to October 31 last, compared with 10 per cent. for the previous year. Profit for 1939-40 is stated at £81,868 (against £104,788). Issued Ordinary capital is £500,000 in 5s. shares, which are quoted at 6s. 3d.

Biscuit Manufacturer's Profit

The net profit of Messrs. Gray, Dunn and Co., Ltd., biscuit manufacturers, Glasgow, for 1940, after depreciation, taxation and contingencies, amounts to £10,959 (£10,643), and £13,646 (£13,565) brought in. Preferred Ordinary dividend for the year again 7½ per cent., and £15,262 carried forward.

* * *

"Glaxo" Profits

Joseph Nathan, manufacturers of Glaxo and other food products, have already announced the maintenance of the 10 per cent. dividend on a capital enlarged by a 150 per cent. scrip bonus. In the full accounts for the year to September 30, 1940, gross revenue is shown to have risen from £139,766 to £146,249, but net profit is slightly lower at £87,600, against £88,510, owing to an increase of £10,500 in the taxation charge, which takes £36,500. The 10 per cent. rate is covered comfortably, £34,955 being transferred to general reserve.

In the consolidated balance-sheet floating assets are up from £1,111,456 to £1,226,435, mainly owing to a rise in the stock-in-trade item from £380,360 to £549,152. There is an increase of £150,000 to £861,102 in current liabilities, bank advances having risen from £118,291 to £145,256

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Bovril Ltd.

Presiding at the forty-fourth annual general meeting of Bovril Ltd., the Lord Luke, K.B.E. (chairman), after dealing with the accounts, said that running businesses at present was an adventure all the time. Industry provided the wherewithal that financed the whole superstructure, and the food, clothing and other necessaries for the people. You might have your works bombed out any night: you had got to think ahead: if you did not, you would find the military or some new officials right across your path at a critical moment. You could forget the profit factor, but you had to remember that your business was not only running to preserve the savings of thousands of small investors, but for the benefit of the population in general.

As an increase in Bovril sales had become an inconvenience, it was something of a nuisance that sales had almost run away with the company of late, and they were cutting down their advertising to see if thereby they could restrict them. That they should have to try to reduce sales seemed a little topsy-turvy, but no one had any idea of the impediments that cropped up daily in the way of production, and particularly in the way of packing an article in small units such as were essential for popular distribution in these times.

It had become necessary to meet not only all their Service orders promptly, but also this increase of ordinary trade. If, as Lord Luke hoped, the war was over by the time of the next annual meeting, he would have pleasure in telling them some stories of the astounding difficulties surmounted by what remained of their staff and workpeople.

INFORMATION AND ADVICE

Rust on Cooking Tins—Confectionery Recipes—Heating of Honey—Information Supplied—Information Required

Rust on Cooking Tins

6,575. *We are having difficulty with the enclosed tins rusting on account of the wet steam process of cooking which they undergo. These tins are used for the manufacture of steak puddings and sold to local restaurants, etc. The tins are collected and used again repeatedly until they are worn out. We wondered whether you could advise us of any way in which these could be treated to prevent rusting. We understand the tins used for canning are lacquer sprayed. Do you think that this would solve the problem? If so, perhaps you could put us in touch with a firm of lacquer suppliers.* (Lancs.)

There is, of course, no similarity between your tins, which are used repeatedly, and the tins for canned goods, which are only used once. In our opinion, the use of lacquer would not meet the case, as it would tend to wear off. We nevertheless send you the names of lacquer manufacturers to whom you might refer your problem. One solution of your difficulty would be to have the receptacles retinned from time to time.

We are also giving you the name of a manufacturer who is making a coating which, it is claimed, makes metal corrosion-resisting, and, although we are not sure that this is applicable to your particular case, we suggest that you write to him.

Confectionery Recipes

7,273. *Would you please give me a recipe for the following:*
1. Caramel Paste. This is used for making caramels, and is, I believe, made from sugar, butterfat and milk.
2. Nougat Powder. For the manufacture of nougat.

We give you some recipes for caramel paste and nougat powder from N. F. Scarborough's book *Sweet Manufacture*.

Caramel Paste.

(1) 27 lb. white sugar.
27 lb. glucose.
26½ lb. full-cream sweetened condensed milk.
12½ lb. hardened coconut oil.
7 lb. butter.
2 oz. salt.
3 drm. vanillin crystals.

Melt carefully and boil quickly to about 250° F., stirring well. Add vanillin at the latest possible moment. Caramel should be of a very light colour with a soft bite.

(2) 42 lb. brown sugar (pieces).
26 lb. glucose.
6 lb. hardened coconut oil.
26 lb. wheat flour.
6 oz. salt.
Coumarin to taste.

Dissolve sugar, glucose and fat. Work in flour and boil to about 280° F.

Nougat Powder.

67½ lb. glucose.
23 lb. white sugar.
7½ lb. fine coconut.
12 oz. albumen.

Soak albumen in water until dissolved. Put dissolved albumen and 15 lb. glucose in stirring pan, and beat under slight heat until a good cream is obtained. Boil the remaining glucose and sugar to about 280° F. in a separate pan and pour this syrup slowly into the albumen, beating all the time. Add coconut, beat in and turn out.

Heating of Honey

7,311. *As subscribers to your journal we wondered if you would be good enough to give us any information regarding the method of heating honey preparatory to bottling. The honey in question is in 28- and 56-lb. tins.* (Leeds.)

The heating of honey in large metal containers offers a choice of evils. V. G. Milum, in the *American Bee Journal* of September, 1939 (an abstract is given in the *Bee World* [England], Vol. 21, 1940, p. 21), points out that long-continued warming or even storage at temperatures above 70° F. leads to loss of aroma and flavour and to considerable darkening of the honey, whether the honey is in glass or not. This darkening is distinct from that occasioned by contact with the metal of imperfectly lacquered tins or tanks, and is also apparently distinct from the caramelisation which ensues when honey is overheated. He recommends heating the large tins as quickly as possible to 160° F., holding them at that temperature for 30 minutes, then straining the contents through a closely woven cloth and bottling direct while warm, avoiding the formation of bubbles and the entanglement of air. The bottles should not be quite filled, so as to leave some air space, and contact with metal lids during and after bottling should be guarded against. Store at any convenient temperature below 70° F.

The purpose of heating to this relatively high temperature is to prevent, as far as possible, granulation while in the bottles. Honey reheated at low temperatures is prone to granulate with an unpleasant texture. Some people, however, prefer to heat very slowly, as attempts at rapid heating of honey, unless very carefully conducted, are liable to lead to local burning. Those who heat slowly sometimes use a heat-insulated box large enough to contain several (say four) tins and use electric lamps as heaters. This avoids all danger of burning, but is probably inadequate to raise the temperature to 160°. We would suggest that you consider which method would suit you best and make a trial run, keeping the resulting bottled honey under observation to note change of texture and aroma.

Information Supplied

6,545. *We shall be glad if you could give us the names of any firms manufacturing Grain Conditioning Plant and also Flour Improvers.* (London.)

Names were given.

6,548. *We should be interested to know whether you could tell us if "Sodium Glutinate" is the same product as "Sodium Glutanate". Also could you tell us of a source of supply of the former. We are also interested in obtaining regular supplies in fairly large quantities of dried and powdered vegetables. Do you happen to know of a firm who could meet our requirements in this regard?* (London.)

We think you mean Sodium Glutamate. Source of supply of Sodium Glutamate was given. Difficulty in obtaining dried vegetables will be found, but suggestions were made.

6,549. *We were interested in an article published in* Food Manufacture *on Mono- and di-Glycerides, and would be glad if you could inform us as to the source of supply of these materials so that we may be able to obtain samples for test purposes overseas.* (London.)

Sources of supply were indicated.

6,550. *We would be very much obliged if you would let us have the address of the firm which is making the machine for peeling onions.* (Wigan.)

Suggestions were made.

6,553. *We are searching for the makers of Date-Stoning Machines, and have been informed that you might be able to put us in touch with one or more firms who produce these machines. If so, we shall be very greatly obliged for your courtesy.* (Somerset.)

Names of possible suppliers were given.

6,654. *Could you please let us know the names of any makers of Apple-paring Machines in England?* (Stockton-on-Tees.)

Names were given.

Information Required

7,273. *Would you please give me a recipe for "hard butter" or "confectioner's butter" and also tell me what is "chocolate neat-work", and, if possible, how it is made?* (Dublin.)

7,403. *Your name has been given to me in connection with a suitable recipe for the manufacture of egg substitute. I shall be obliged if you will kindly let me have such a recipe, and perhaps you would also let me know the best market in which to purchase the different materials which constitute egg substitute.* (Retford.)

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

Improvements relating to a Method of and Apparatus for Canning Food Products

The invention relates to an improved method of canning food products of the discrete particle type and to an apparatus for carrying out the method, and has particular reference to a continuous sequence of operations in a food canning method by means of which the food product is cimpletely and quickly sterilised, cooled, filled into sterilised cans and hermetically sealed under sterile and sterilising conditions.

This accordingly provides a method of canning food products of the discrete particle type which comprises segregating from a supply thereof a predetermined quantity of the product which is sufficient to fill a single can sterilising the segregated product by high temperature heat treatment, extracting some of the heat from the sterilised product, filling the sterilised product into a sterilised can, and sealing the filled can with a sterilised can cover.

The invention also provides an apparatus for carrying out the said method, the combination of a hopper for segregating and holding the predetermined quantity of the product to be canned, means for circulating live steam in the hopper to partially sterilise the product therein, a filling tube for receiving the partially sterilised product from the hopper, means for circulating live steam through the product within the filling tube to continue its sterilisation, means for closing the tube with the product confined therein and means for introducing live steam at an increased temperature into the confined product within the filling tube to complete the sterilisation of the product, means for extracting some of the heat from the sterilised product, means for filling the sterilised product into a sterilised can and means for sealing the filled cans with a sterilised cover.

The apparatus comprises a hopper adapted to segregate and hold the predetermined quantity of the product, means for introducing steam into the hopper so that it will circulate among the particles of the product to begin the sterilisation of the same, a filling tube for receiving the partially sterilised product from the hopper, means for introducing steam into the filling tube to complete the sterilisation of the product, means for extracting some of the heat from the sterilised product while in the filling tube, means for filling the sterilised product into a sterilised can while in a sealed filling chamber and means for sealing the filled can with a sterilised cover while in the said chamber.

Preferably the apparatus is of the turret type comprising a stationary frame, a supply reservoir mounted on said stationary frame, a movable turret adapted to rotate relative to said frame, a plurality of slide units carried on said movable turret, a plurality of filling tubes mounted on and movable with said turret, each of said slide units having a hopper adapted to segregate and hold the predetermined charge of product from the reservoir and to transfer it into a said filling tube, means for introducing steam in said charge of product in the hopper to begin sterilisation of the product, means for introducing steam into said filling tube to complete the sterilisation of said product, means for cooling the product while within said tube, and means for filling the sterilised and cooled product into a sterilised can, and means for sealing the filled can with a sterilised cover.

527,011. American Can Company.

Latest Patent Applications

18245. ENOCK, A. G.: Means for filling bottles, etc., with liquids or powders. Dec. 31.

18247. SMITH, T. B., and DORMAN, LONG AND CO., LTD.: Methods for separating suspended particles of solid matter from water, etc. Dec. 31.

18262. STOCKHAMER, P.: Treatment of fish. Dec. 31.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

530,675. PEDERSEN, T.: Production of an animal food.

530,676. STEVENS, A. H. (DAVIDSON MANUFACTURING CORPORATION): Conveyors. (Divided out of 530,619.)

530,773. DUMMLER, W.: Machines for making edible ice. (Cognate application 19345/39.)

530,865. FALLER, L.: Apparatus for handling pulverulent materials.

530,889. ROSE, R. C., and CEFOIL, LTD.: Manufacture of transparent films.

531,047. LEVER BROS. and UNILEVER, LTD.: Refining of oils and fats.

531,052. SMITH, F. C.: Cooling of liquids.

531,145. UNITED GLASS BOTTLE MANUFACTURERS, LTD., BUNCE, A., and DORMAN, E. P.: Methods of and means for improving the durability of glass containers.

531,147. BRITISH THOMSON-HOUSTON CO., LTD.: Gyrators for washing machines.

531,560. BEDFORD, R. H.: Manufacture of ice and ice glazes for comestibles.

531,578. SMITH, R. W.: Cold-storage locker room.

531,605. BURGER, W., and ROSE, DOWNS AND THOMPSON, LTD.: Extraction of fish oils.

531,661. LEHMANN, F. B.: Apparatus for emptying chocolate moulds or the like.

531,700. VICARS, LTD., T. AND T., and CROSLAND, E. M.: Picking up and packing of biscuits and other flat artices.

533,481. HORVATH, E. VON: Apparatus for reconditioning and preserving grain, legumes, vegetables and the like.

533,490. STEWART AND CO., LTD., D. (FELTHAM, O. A., DYMOND, G. C., and MURRAY, P.): Apparatus for taking samples of sugar cane during conveyance in a cane conveyor.

533,523. LYONS AND CO., LTD., J. (MOWBRAY, E. G. B. DE, and GRIDLEY, E. H.): Manufacture of tea.

533,926. LITTLE, S. G.: Means for the vending and storage of foodstuffs, groceries, vegetables, and like articles of commerce.

534,010. BLISS CO., E. W.: Method of testing cans for air-tightness.

534,214. PEEBLES, D. D., and MANNING, P. DE V.: Process for the manufacture of whey powder.

TRADE MARKS

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

TUDOR CLOSE.—612,099. Jam, marmalade, fruit jellies, lemon curd, and mincemeat. **Alan Cuthbert Paget Vince,** trading as Arrow Preserving Co., 21, Lovat Lane, London, E.C. 3.

RELIANCE.—612,541. Sardines. **Martin Stichaner Roth,** Largo do Figueiredo No. 6, Belem, Lisbon, Portugal; packer. Address for service is c/o Sefton-Jones, O'dell and Stephens, 2, Gate Street, Lincoln's Inn Fields, London, W.C. 2.

VAN.—612,653. Puffed rice. **The Crystal Confectionery Co., Ltd.,** 2, Evelyn Street, Deptford, London, S.E. 8. (By Consent.)

MACAR-MERIN. — 612,665. Confectionery and preparations of egg or egg substitute and of sugar or sugar substitutes for use in the manufacture of confectionery. **Blackwell Hayes and Co., Ltd.,** 54, Moor Street, Birmingham, 4.

GAZELLE.—612,712. Aerating powders for use in baking. **Albright and Wilson, Ltd.,** Shell-Mex House, Strand, London, W.C. 2.

ABSO.—612,764. Sausage binding material. **Carter Products, Ltd.,** 6, Love Lane, Wood Street, London, E.C. 2. (By Consent.)

Registration of this trade mark shall give no right to the exclusive use of the words "Tom Piper".

AZTEC.—612,771. Cocoa, coffee, chocolate and tea. **Twentieth Century Coffee Corporation, Ltd.,** 36, Mark Lane, London, E.C. 3.

FURNIX.—613,143. Economising apparatus for fuel. **F. Graucob, Ltd.,** 70, 72 and 74, City Road, London, E.C. 1; manufacturers. Oct. 28, 1940.

NEW COMPANIES

Mars Chocolate, Limited. (364,706.) To carry on bus. of mnfrs. of and dlrs. in chocolate, etc. Nom. cap.: £100 in £1 shares. Dirs.: To be appointed by subs. Subs.: J. E. Walker, 170, Poplar Road South, S.W. 19 (clk.); Lily Page, 43, Thackeray Road, E. Ham, E. 6 (clk.).

Mandrews (Halifax), Limited. (364815.) To carry on bus. of biscuit mnfrs. and distributors, etc. Nom. cap.: £100 in £1 shares. Dirs.: Not named. Subs.: T. Knox Wright, The Close, Fenny Drayton, Leics.; F. R. Wright, Holme Dene, Stafford Avenue, Halifax.

Winchcombe Flour Mills, Limited. (364845.) To carry on bus. of flour and grist millers, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: A. E. Titchmarsh, Lower Mill, Broadway, Worcs; S. C. Watson, Roma, Gretton Road, Winchcombe, Glos.

Baillie Mills, Limited. (364847.) 84, Chancery Lane, W.C. 2. To carry on bus. of bakers, confectioners, etc. Nom. cap.: £100 in 1s. shares (1,000 "A", 200 "B", 200 "C", 200 "D", 200 "E" and 200 "F"). Dirs.: D. J. H. Kay, 57, Culverdon Road, Tunbridge Wells (permt.); Emily M. Kay, 57, Culverdon Road, Tunbridge Wells; E. S. Mitchell, 15, Bayhall Road, Tunbridge Wells.

Ewart Perkins and Co., Limited. (364956.) 79, Piccadilly, Manchester. To carry on bus. of dlrs. in tinned, potted and preserved goods and condiments, etc. Nom. cap.: £100 in £1 shares. Dirs.: P. Hodgson, 87, Cheadle Road, Cheadle Hulme, Ches.; W. E. Hodgson, 17, Marriner Drive, Bradford; A. P. Hatton, 192, Toller Lane, Bradford.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.